

HONG KONG BAPTIST UNIVERSITY
Faculty of Science

1. **Course Code and Course Title**

GFQR1056 Be a Smart Financial Planner (3,3,0)

2. **No. of Units**

3

3. **Offering Department**

Department of Mathematics

4. **Pre-Requisite**

Nil

5. **Co-Requisite / Anti-Requisite (if any)**

Nil

6. **Aims & Objectives**

The course aims at equipping students with quantitative skills of solving recursive relationship for their daily money management. We will introduce to students a basic understanding of quantitative reasoning behind smart financial management. This is to maximize the profit in different financial situations by applying the quantitative methods in money-related problems.

Using high school level mathematics, students will apply basic math and computational skills to analyze some real-world problems in personal financial management and find the best option to suit the situations. The examples include choosing the most suitable insurance policy, comparing the different savings packages for different long-term purposes, and setting the rent amount to reduce the stress in the mortgage plan, and more.

By exploring underlying mathematical models, students can develop a scientific methodology for analyzing financial products and solving monetary problems with the help of computational tool(s), e.g., excel, matlab, python.

7. **Course Intended Learning Outcomes (CILOs)**

CILO	By the end of the course, students should be able to:	PILOs
1	Understand importance of money-related products and its relevant technology in digital age.	1,4
2	Identify the mathematical models for quantitative data from daily financial applications	2,3
3	Utilize computational tools to solve financial problems	2,3
4	Make smart decisions with sound quantitative reasoning in various financial and social problems	2,3,4,5

8. **Teaching & Learning Activities (TLAs)**

CILO No.	TLAs
1,2,3,4	<p>Lecture</p> <p>There are nine separate modules. In each module, students will be introduced to basic concepts and real-life financial problems. The instructor will then discuss how to use students' own mathematical ideas/concepts to construct the corresponding mathematical models for real cases, from simple to complicated scenarios, in order to develop gradually the modelling and computational skills required for solving these kinds of problems. Analyzing the models and solving the problems by computational tool(s), e.g., excel, matlab, python. will be demonstrated.</p>
2,3,4	<p>In-class activity</p> <p>A wide variety of examples and applications drawn from everyday life will be presented to students for further discussion. During classes and tutorials, students have the opportunity to participate in activities of various forms, including discussions, in-class exercises, programming / software practices, and the instructor and TA will also jump in their discussions for clarification or help. Real-life examples from various disciplines will be assigned to be completed in classes. Students may first discuss with each other to figure out the required models and some possible solutions. The instructor/tutor will observe and provide directions, if needed. Students will then perform the real-time programming tasks independently. Feedback will be given after the completion of work. Students will need to participate in the team discussion by expressing their own opinions about the suitable mathematical knowledge and model can be applied and figure out which mathematical tools are useful in solving the problems. Open questions will also be given to stimulate students' interest. With students from various backgrounds, instructor/tutor would facilitate discussions by using some historical data on differing value systems among different disciplines and guide students to apply this to the problem-solving.</p>
1,2,3,4	<p>Case Study</p> <p>Students will be encouraged to create meaningful real-life scenarios in or be given some problem domain containing both realistic and hypothetical frameworks. In either case, students will need to determine what kind of mathematical knowledge/model can be applied to simplify the case. This practice requires students to explore more profound knowledge into the topics with the discussion within and between teams. This not only allows students to consolidate their knowledge obtained during lectures, but also improves students' decision-making skills with grounded reasoning via group communication and exploration. Students with different backgrounds are welcome to propose the scenarios based on their needs related to majors and disciplines.</p>

Assessment Methods (AMs)

Type of Assessment Methods ABC	Weighting	CILOs to be Address	Description of Assessment Tasks
In-class exercises	15%	1,2,3	Three exercises (5% each) are designed to help students understand the topic in the separate module. Questions in each exercise will contain a single topic. Each set will allow the instructor to keep track of students' performance in mastering

			the concepts and, most importantly, allow students to practice the newly learnt mathematical arguments and computational skills.
Written Assignment	35%	1,2,3	Five sets of assignments (7% each) are designed to have more complex concepts and the questions in assignments will combine more than one topic so they can serve as formative continuous assessments of students' facility with integrated concepts and analytical ability.
Mini Project	20%	1,2,3,4	<p>Students work in a small group up to 5 members. This will engage students' learning with the reality by requiring students to manipulate and analyze the collected data from different real-life financial situations, and then formulate/solve the proposed problems by quantitative reasoning to work out various possibilities, e.g. the best choice among the offers provided by various companies. Students will give group presentations and it allows the instructor to assess how well students perform in the following criteria.</p> <ul style="list-style-type: none"> • 5%: ability to identify the problem. • 5%: ability to analyze the problem. • 4%: verification of the problem by online tool • 3%: clarity of presentation. • 3%: ability of working as a team.
Reflective Report	10%	2,3,4	<p>Every student is required to submit an individual reflective essay (500-800 words) after the project to discuss the connection to the course contents, reflect on the topic(s) and link them to other disciplines.</p> <p>The reflective report allows the instructor to assess how well students perform in the following criteria.</p> <ul style="list-style-type: none"> • 2.5% individual contributions to the group project • 2.5% clarity and style • 2.5% context • 2.5% connection and reflection

Quiz	20%	2,3,4	Two quizzes will be given to assess how well the students have learned the concepts and knowledge of a completed component of the course. Questions in this part will come with several integrated topics introduced in lectures. It is designed to be a comprehensive test, covering all topics of the entire course, to assess how far students have achieved the course intended learning outcomes. Part of the quiz will be primarily based on those seen in the mini project/assignments or will be questions analogous to those discussed in lectures in order to test whether students can successfully apply the methodology they have learnt in class to solve problems appropriately. The rest will be used to assess students' abilities on tackling new problems.
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10. **Assessment Rubrics**

To be determined by the instructor

11. **Course Intended Learning Outcomes and Weighting**

Content	CILO No.	Teaching (in hours)
1. How interest rates work	1,2,3	6
2. What is inflation	1,2,3,4	3
3. Ready to invest	1,2,3	3
4. Plan for retirement	2,3	3
5. Annuities	1,2,3	3
6. Pay less by credit cards	1,2,3,4	6
7. Good bargain in buying cars	1,2,3,4	3
8. Less stress in mortgage	2,3	3
9. Volatility in the investment market	1,2,3,4	3
10. Two quizzes and presentation	1,2,3,4	6

(The order of contents are based on the computational techniques and the complexity of topics.)

12. **Textbooks / Recommended Readings**

General Reading List and References:

1.	L. Ling (2012). <i>Manage Your Money without Formulas</i> . HKMS Texts in General Education, Vol. 2. Pearson Education.
2.	Arthur L. (2007). <i>An Introduction to the Mathematics of Money</i> . Springer.

3.	Rentz, W.F., Kahl, A. (2017). <i>Financial Mathematics with MS Excel 2016: Time Value of Money</i> . CreateSpace Independent Publishing Platform.
4.	Walkenbach, J. (2015). <i>Microsoft Excel 2016 Bible</i> . Wiley.
5.	Ferguson, N. (2009). <i>The Ascent of Money: A Financial History of the World</i> . Penguin Books.
6.	Davies, G. (2016). <i>A History of Money</i> (4th edition). University of Wales Press.
7.	Latter, T. (2007). <i>Hong Kong's Money: The History, Logic and Operation of the Currency Peg</i> . Hong Kong University Press.
8.	Frasca, R.R. (2008). <i>Personal Finance: An Integrated Planning Approach</i> (8th Edition). Pearson Education (US).

13. Course Content

Topic	Contact Hours
Weeks 1 & 2 TLA: Lecture and In-class activity Topic and engagement: <ul style="list-style-type: none"> • The impact of technology and spreadsheet software on? the connection between money-related technology and money • Simple and compound interests • Backward problems to figure out the missing numerical datum, e.g., working out which annual interest rate can yield a pre-determined target amount • Computational demonstration – hands-on experience to solve backward problems Readings: <ul style="list-style-type: none"> • Lecture notes 1 and 2 • Chapter 1 of ref. #1 • Ref. #3 	6 Hours
Week 3 TLA: Lecture and In-class activity Topic and engagement: <ul style="list-style-type: none"> • Inflation – add inflation rates to scenarios discussed in previous weeks • Computational demonstration – hands-on experience to find the real purchasing power when inflation factor gets involved Readings: <ul style="list-style-type: none"> • Lecture note 3 • Chapter 3 of ref. #2 • <i>Hong Kong Inflation Rate</i>, 2022 from https://tradingeconomics.com/hong-kong/inflation-rate-mom • <i>United States Inflation Rate</i>, 2022 from https://tradingeconomics.com/united-states/inflation-cpi 	3 Hours

<p>Weeks 4 & 5</p> <p>TLA: Lecture, In-class activity, and Reflection</p> <p>Topic and engagement:</p> <ul style="list-style-type: none"> Investment – compare with more flexible savings plans, e.g., deposit in particular time with a fixed amount, or with a non-fixed amount Retirement – compare different retirement plans to make a suitable package for personal needs Computational demonstration – hands-on experience to find and compare the final returns under different settings Quiz – reflect the learning with the discussed topics <p>Readings:</p> <ul style="list-style-type: none"> Lecture notes 4 and 5 Chapters 7, 8 of ref. #1 Chapter 4 of ref. #2 <i>Arrange for an appointment with our wealth management experts or explore our retirement planning tools (HSBC)</i> from https://www.hsbc.com.hk/wealth-management/retirement/ 	<p>6 Hours</p>
<p>Week 6</p> <p>TLA: Lecture and In-class activity</p> <p>Topic and engagement:</p> <ul style="list-style-type: none"> Loans – discuss the similarities and differences among personal loan, personal line of credit, and student loan Computational demonstration – hands-on experience to find the repayment amounts corresponding to different period lengths <p>Readings:</p> <ul style="list-style-type: none"> Lecture note 6 Chapter 12 of ref. #1 <i>Applying for Student Financial Assistance</i> from https://www.gov.hk/en/residents/education/financialassistance/postsecondary/assurances.htm 	<p>3 Hours</p>
<p>Weeks 7 & 8</p> <p>TLA: Lecture and In-class activity</p> <p>Topic and engagement:</p> <ul style="list-style-type: none"> Credit card – introduce real-life examples to show local banks charge interest on transactions done on different dates Computational demonstration – hands-on experience to find how long to clear the debt <p>Readings:</p> <ul style="list-style-type: none"> Lecture note 7 Chapter 7 of ref. #2 <i>How Credit Card Interest Works</i> from https://www.youtube.com/watch?v=_HfXfKLYV68&ab_channel=HonestFinance 	<p>6 Hours</p>

<p>Week 9</p> <p>TLA: Lecture and In-class activity</p> <p>Topic and engagement:</p> <ul style="list-style-type: none"> • Car loan –discuss real-life local examples to illustrate how local car companies break down the principal and interest by the rule of 78 • Computational demonstration – hands-on experience to find when to pay off earlier that the total interest is the minimum <p>Readings:</p> <ul style="list-style-type: none"> • Lecture note 8 • Chapter 5 of ref. #2 • Chapter 17 of ref. #1 	<p>3 Hours</p>
<p>Weeks 10 & 11</p> <p>TLA: Lecture and In-class activity</p> <p>Topic and engagement:</p> <ul style="list-style-type: none"> • Mortgages – compare fixed rate, non-fixed rate, and fluctuating rate of current HK mortgage packages based on prime rate and/or HIBOR, and to compare the advantages and disadvantages of different products available in the local market • Stocks – The dollar-cost averaging strategy (a fixed amount of money per month) and its simple variant (a fixed number of shares per month) will be introduced and compared using simulated data under a constant drift with some white noise volatility. • Computational demonstration – hands-on experience to generate random numerical data <p>Readings:</p> <ul style="list-style-type: none"> • Lecture notes 9 and 10 • Chapters 14, 15 of ref. #1 • <i>How Mortgage Interest Works</i> from https://www.youtube.com/watch?v=1tngZcGW9Rc&ab_channel=HonestFinance 	<p>6 Hours</p>
<p>Weeks 12 & 13</p> <p>TLA: Presentation and reflection</p> <p>Engagement:</p> <ul style="list-style-type: none"> • Quiz – reflect the learning with the taught topics • Presentation – a group up to 5 students produces some PowerPoint slides (5 – 10 pages) to present in front of the class. <p>Readings:</p> <ul style="list-style-type: none"> • Ref. #4-#8 to help students setup the scenario 	<p>6 Hours</p>
<p>Total:</p>	<p>39 Hours</p>

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Approved by General Education Committee meeting on 29 March 2023.

Approved by General Education Committee meeting on 21 April 2023.

Approved by Faculty Board meeting on 17 May 2023.