



FUNDAMENTALS OF BUSINESS MATHEMATICS

Department of International
Business & Marketing

NUST Business School

National University of Sciences & Technology

Course Details

Course Title:	Fundamentals of Business Mathematics	Credit Hours:	3
Course Code:	MATH-114	Prerequisite:	None
Program:	BBA 2k26	Sections:	A & B & C

Course Faculty

Instructor:	Dr. Rizwan Jahangir
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Course Description

The course of Fundamental of Business Mathematics helps students learn the basic concepts of mathematics required to solve problems in business scenarios. The students will learn the concepts related to linear equations, mathematical functions, mathematics of finance, matrix algebra, differentiation, and optimization techniques. The students are given examples in business settings as word problems where these mathematical techniques and concepts are applicable.

Course Learning Outcomes

By the end of the module students will be able to:

- CLO 1: Show** an understanding of the basic mathematical concepts in business setting.
- CLO 2: Relate** mathematical concepts to business decision making.
- CLO 3: Apply** the mathematical tools to business problems.
- CLO 4: Model** solutions for optimization problems in business setting.

Program Goals & Learning Objectives

Goal 1: Students will be able to solve business problems using disciplinary knowledge

Learning Objective 1.1: Students are able to understand problems in a business setting.

Learning Objective 1.2: Students are able to develop solutions to business problems.

Goal 2: Students will be able to perform as competent team players

Learning Objective 2.1: Students are able to demonstrate effective behavior for achieving team goal(s)

Goal 3: Students will be able to communicate effectively

Learning Objective 3.1: Students are able to deliver effective oral presentations.

Learning Objective 3.2: Students are able to articulate their ideas in written form.

Goal 4: Students will be able to evaluate ethical dilemmas arising from a business situation

Learning Objective 4.1: Students are able to identify ethical dilemmas arising from a business situation

Learning Objective 4.2: Students are able to resolve ethical dilemmas arising from a business situation.

Goal 5: Students will be able to demonstrate technological skills and analyze the implications of emerging technologies on organizations and society

Learning Objective 5.1: Students are able to effectively demonstrate technological skills

Learning Objective 5.2: Students are able to analyze the impact of emerging technologies on organizations and society

Mapping - CLOs with LOs

Learning Objective	LO 1.1	LO 1.2	LO 2.1	LO 2.2	LO 3.1	LO 3.2	LO 4.1	LO 4.2	LO 5.1	LO 5.2	Not mapped	Evaluation Item
CLO 1	■											Class activities/Quiz
CLO 2	■											Class activities/Assignment
CLO 3	■											Quiz/Exams
CLO 4	■											Assignments/Exams

Legend: ✓ indicates mapped and assessed CLO, ■ mapped but not assessed and × unmapped CLO.

Required Course Material

Textbook(s): Frank S. Budnick, Applied Mathematics for Business, Economics, and The Social Sciences, 4th Edition, McGraw Hill Inc.

Students are advised to complete the relevant practice problems posted along with the lecture from the textbook. Slides will be posted on the NUST LMS portal but it is student's responsibility to consult additional information shared during the lectures and do practice problems from the book.

Course Evaluation (Grade Breakup)

Grading will be done as per NBS criteria. The breakup of the grade points is as follows:

Final Exam	45 %
Mid Semester Exam	25%
Assignments/Class Activities	15%
Quizzes	15%

Course Content (Weekly)

Week	Lecture No. and Topic	Preparation Material	Outcomes
1	Lectures 1 & 2 Linear Equations	Chapter 2 (Sections 2.1–2.4) Characteristics and graphical representation of linear equations; intercepts; slope; slope-intercept form; determining the equation of a straight line.	CLO 1 CLO 3

2	Lectures 3 & 4 Systems of Linear Equations	Chapter 2 (Sections 2.5–2.6) Linear equations involving more than two variables and applications. Chapter 3 (Sections 3.1–3.3) Two- and three-variable systems; elimination and Gaussian elimination.	CLO 1 CLO 3
3	Lectures 5 & 6 Mathematical Functions	Chapter 4 (Sections 4.1–4.3) Functions, notation, domain and range; types of functions; graphical representation; vertical line test.	CLO 1 CLO 2
4	Lectures 7 & 8 Linear Functions and Applications	Chapter 5 (Sections 5.1–5.3) Linear cost, revenue and profit functions; other applications; break-even models. Assignment / Class Activity 1	CLO 2 CLO 3
5	Lectures 9 & 10 Quadratic Functions	Chapter 6 (Sections 6.1–6.2) Quadratic functions and their characteristics; graphical representation; applications including demand, revenue and related business models. Quiz 1	CLO 3
6	Lectures 11 & 12 Exponential and Logarithmic Functions	Chapter 7 (Sections 7.1–7.3) Characteristics and applications of exponential functions; logarithms and their properties; solving exponential and logarithmic equations.	CLO 3
7	Lectures 13 & 14 Mathematics of Finance	Chapter 8 (Sections 8.1–8.2) Simple and compound interest; compound growth; single payment computations; present and future value; effective interest rates. Assignment / Class Activity 2	CLO 1 CLO 3
8	Lectures 15 & 16 Annuities and Financial Applications	Chapter 8 (Sections 8.3–8.5) Future and present value of annuities; determining annuity size; mortgages; cost-benefit analysis and discounted cash flow. Quiz 2	CLO 2 CLO 3
9	Mid-Semester Examination Week		
10	Lectures 17 & 18 Matrix Algebra	Chapter 9 (Sections 9.1–9.3) Introduction to matrices; special types of matrices; vectors; matrix operations; inner product; matrix multiplication; representation of equations and systems.	CLO 1 CLO 3
11	Lectures 19 & 20 Matrix Algebra and Applications	Chapter 9 (Sections 9.4–9.6) Determinants; Cramer's rule; inverse of a matrix; inverse and systems of equations; selected applications. Assignment / Class Activity 3	CLO 1 CLO 3

12	Lectures 21 & 22 Differentiation I	Chapter 15 (Sections 15.1–15.4) Limits; continuity; average rate of change; derivative; instantaneous rate of change; limit approach to finding the derivative.	CLO 1
13	Lectures 23 & 24 Differentiation II	Chapter 15 (Sections 15.5–15.8) Rules of differentiation; chain rule; instantaneous-rate-of-change interpretation; higher-order derivatives. Quiz 3	CLO 1 CLO 2
14	Lectures 25 & 26 Optimization: Methodology	Chapter 16 (Sections 16.1–16.4) First derivative; increasing and decreasing functions; concavity and inflection points; critical points; maxima and minima; first- and second-derivative tests; curve sketching and restricted domains.	CLO 1 CLO 2
15	Lectures 27 & 28 Optimization: Applications	Chapter 17 (Sections 17.1–17.2) Revenue, cost and profit applications; marginal approach to profit maximization; selected optimization applications. Assignment / Class Activity 4	CLO 3
16	Lectures 29 & 30 Linear Programming and Simplex Method	Chapter 10 (Sections 10.1–10.3) Linear programming formulation; graphical solutions; feasible region; corner-point solutions; applications. Chapter 11 (Sections 11.1–11.2) Simplex preliminaries and introduction to the simplex method. Quiz 4	CLO 3 CLO 4
17	BUFFER WEEK		
18	Final Examination Week		

Details of Assessments

Assignments/ Class Activities (15%)

Class activities will be conducted on mentioned weeks throughout the semester to promote active student engagement and application of course concepts. Students are required to be present and prepared at the scheduled start time of each class, as **no prior announcement** will be made via email or LMS regarding the exact dates of these activities. All activities and assignments must be completed independently; however, students are encouraged to seek clarification and guidance from the instructor when needed. Please note that **no make-up opportunities** will be provided for missed class activities or assignments under any circumstances.

Quizzes (15%)

- A total of **four quizzes** will be administered during the semester, all are announced in advance.
- Students arriving late will not be permitted to take the quiz. There is **no “best-of” policy or retake option** for missed or low-scoring quizzes.

- Any form of **academic dishonesty** or even the creation of suspicion during a quiz will result in the immediate cancellation of that quiz attempt and may lead to further disciplinary action in accordance with university regulations.

Examination (45+25%)

- The course will include two examinations: a **Midterm Exam (25%)**, scheduled in the 9th week, and a **Final Exam (45%)**, scheduled in the last week. These assessments are designed to evaluate students' understanding and application of the subject matter.
- Examinations will primarily consist of **unseen word problems**, requiring students to provide clear, detailed, and well-reasoned solutions in accordance with the requirements of each question.
- Students are permitted to use **basic scientific calculators** for computational purposes only; however, the exchange of calculators during examinations is strictly prohibited.
- Any form of **academic dishonesty** or even the creation of suspicion during an examination will result in disciplinary action in accordance with university policy.

Dates to Remember

The dates/weeks provided below are a reasonable estimate of due dates for quizzes, assignments, and project-related material submissions. These may be subject to modification by the instructor due to unforeseen circumstances/minor modifications in the course. However, until informed so, please consider these dates/weeks as final.

Week	Assessment Activity
4	Assignment /Class Activity 1
5	Quiz 1
7	Assignment /Class Activity 2
8	Quiz 2
9	Mid-Term Exam
11	Assignment /Class Activity 3
13	Quiz 3
15	Assignment /Class Activity 4
16	Quiz 4
18	Final Exam

Course Policies

No Make-ups Policy for Sessional Assessments:

There will be no make-ups for assignments, quizzes, and case study discussion session under any circumstance.

Class Participation:

You are expected to come to class prepared, i.e., read the material and prepare some opinions/questions to share. It is advised that you discuss your ideas and experiences with regard to how they relate to the concepts discussed in the class. Please note your in-class participation will be closely monitored throughout the semester. Also, it is advised not to argue for the sake of argument; reflect and analyse the

information given to you and think critically!

Attendance:

- In the event of a missed session, students are responsible for consulting the LMS and their classmates to catch up on the missed content.
- Class attendance will be taken during the first 5 minutes of the class. Students arriving after this time may be marked absent for the session. If a student is away on official NUST duty, it is the student's responsibility to inform the instructor in advance and provide an official note.
- Students are responsible for continuously monitoring their own attendance. Requests to change or modify attendance will not be entertained unless there has been an accidental oversight. In such cases, students must inform the instructor of the error, along with appropriate proof, before the end of the respective month.
- A minimum attendance of **75%** is required to be eligible to sit for the examinations. Students who do not meet the minimum attendance requirement will not be permitted to appear in the examinations.

Discipline / Deadline Extension Policy:

Students are intimated in advance that there is no room for deadline extensions in this module for the individual as well as for group activities/ submissions. The sole reason for this is the provision of similar grounds for each student. Therefore, do not ask for any such favours. Prove yourself as an educated, well-groomed individual during your stay.

Academic Integrity:

Students are required *not to indulge in plagiarism and dishonesty* which will be dealt strictly in accordance with the plagiarism policy. Students are free to discuss with their peers and allowed to study in groups; however, on account of individual submissions, whether be it assignments/ projects, you are required to submit your own reflection on the assigned topic. You are responsible for knowing and enacting academic conduct that is in line with the University's statement entitled "Academic Dishonesty". The statement highlights examples of unacceptable behavior which include, but are not limited to, the following:

- **Cheating:** Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise; copying from another student's examination; submitting work prepared in advance for an in-class examination; taking an examination for another person or conspiring to do so.
- **Plagiarism and Penalty**
 1. Plagiarism will NOT be tolerated at any stage during this course. Students using any unethical means to progress in this course will be heavily penalized when being graded. The work will be marked as zero. Further actions against them may also be taken according to NUST's disciplinary policy.
 2. Similarity index of 19% or above will be considered as plagiarized.
 3. Please note that using quotes from other reference material is allowed but is not excluded from similarity check
 4. Similarity of 5% or above with single source will be considered as plagiarism
 5. Use of AI generated content 20% or above will be considered as plagiarism.
 6. The plagiarized assignment or project will be marked as zero.
 7. HEC plagiarism policy is available at
<https://www.hec.gov.pk/english/policies/Documents/Plagiarism-Policy.pdf>

It is expected that all work that is handed will be your own. Any ideas or content that come from another source must be properly cited (including any content taken from the Internet, books, articles and lectures).

Use of Generative AI in this Course:

Generative AI (e.g., ChatGPT, Copilot) may support learning **only** when used transparently, securely, and as an aid but not a substitute for your own thinking and work. You are fully responsible for the originality, accuracy, and integrity of anything you submit. Unauthorized or undisclosed AI use may be treated as academic misconduct under NUST policy. Please use the following guidelines when using Gen-AI tools in this course.

- **Allowed (with disclosure):** language/grammar/formatting improvements to your own drafts; **with rigorous human review** before submission.
- **Not allowed:** generating text or answers for assignments and projects; producing code, analyses or data; creating or substituting synthetic data without a robust approved methodology; relying on AI “facts” without verification; listing AI as an author or team member.
- **Disclosure requirement:** if AI is used, include a brief statement (tool name & version, date, what you used it for, and why) in the location specified by the instructor (e.g., Acknowledgments/Methods). Undisclosed AI use may carry academic consequences.
- **Privacy & security:** do not input personal, confidential, unpublished, or proprietary information into any AI tool; use only trusted tools that safeguard intellectual property (IP) and confidentiality, and only when necessary.
- **Accountability & verification:** independently verify AI outputs (they may be inaccurate or biased); your own analysis and critical thinking must **clearly dominate** all submitted work. Faculty may use judgment (not AI detectors alone) when evaluating suspected misuse.

Missed Classes:

Students are encouraged not to miss classes, however, in the case of such eventuality they are required to follow up with peers and come up well prepared in the classes to come. Make sure it is the sole responsibility of the student to compensate for the losses incurred and *No excuses will be dealt with on this account.*

Consultation & Contact:

You are welcome to visit my office without prior appointment during my regular office hours mentioned in the beginning. Other than that, I am available in my office in the afternoons, except for Fridays, but you must make an appointment at least one day in advance, except in emergency cases. To make an appointment write to me through my official email address, rizwan.jahangir@nbs.nust.edu.pk.

Cell Phone Policy: When cell phones ring and students respond in class or leave class to respond, it disrupts the class. The use of cell phones or similar communication devices by the students during scheduled classes is prohibited. All such devices must be turned off. At the discretion of the instructor, an exception to this policy is possible, in special circumstances.

Reading Policy:

Students are responsible for coming prepared to class. The required reading material assigned for each class must be prepared before the session as this is necessary for conducting a discussion-based interactive session.

Use of Qalam:

It is student's responsibility to regularly visit QALAM for his/her attendance/results/other updates.

Dos and Don'ts:

DO	DO NOT
Come to class on time and having completed the reading material.	Submit assignments, quizzes late. Such assignments and quizzes will not be accepted.
Take notes during the lectures.	Cause disturbance in class.
Listen to lecture, instructions.	Eat/Drink food in class.
Cooperate with the instructor in the best possible manner.	Perform any kind of photography.
Ask the teacher questions for better learning.	Speak or murmur during the lecture.
Let the lecturer know in advance if you need to miss a class.	Ask the lecturer to reschedule deadlines.
Constantly monitor the course outline and have it with you at all times .	Ask the lecturer to change attendance details.
Switch off / Put your phones on silent during class.	Forget to write some form of identification on each document that is due for submission of any kind.
Follow submission instructions for any assessment content.	Make up your own format of labelling / submission of assessed material – you will lose marks for this.