AC – 28/03/2025
Item No. – 6.2 (N) (1a) Sem. III

As Per NEP 2020

University of Mumbai

Syllabus for Basket of OE Vertical 3	
Faculty of Science	
Board of Studies in Mathematics	
Second Year Programme	
Semester	**III**
Title of Paper	**Credits**
I) Quantitative Techniques - III	**2**
From the Academic Year	**2025-26**

Name of the Course: Quantitative Techniques-III

Sr. No.	Heading	Particulars
1	**Description the course: Including but not limited to:**	The approach of the course is to develop the mathematics first and then provide the application to arithmetic and linear algebra. Through this course students delve into topics such sequences, graphing, linear programming, solving polynomials and solving system of linear equations The course aims to equip students with practical analytical skills and mathematical tools applicable to real-world scenarios in arithmatic and linear algebra through matrices.
2	**Vertical:**	Open Elective
3	**Type:**	Theory
4	**Credits:**	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives (CO):** This course provides a thorough examination of basic arithmetic and linear algebra. By the end, students gain a strong understanding of these concepts in real-world scenarios. CO1: To understand sequences and how to graph linear inequalities. CO2: To introduce exponential / logarithmic functions and its relevance in real-world problems. CO3: To find roots of polynomial equations CO4: To use concept of row echelon form of a matrix to solve system of linear equations.	
8	**Course Outcomes (OC):**	
	After completion of the course, students will be able to **OC1:** remember types of sequences so as to use for solving related word problems and remember related theorems to solve polynomial equations. **OC2:** apply linear or quadratic equation so as to formulate the word problem for solving and apply related theorems, concepts/methods to solve polynomial equations. **OC3:** analyse exponential functions & logarithmic functions concept to use in real-world scenarios and analyse Gauss elimination method, Gauss- Jordan elimination method, matrix inversion method to solve system of linear equations **OC4:** check the use of graphs of linear equations and inequalities in solving Linear Programming problems etc and check how to use the concept of system of linear equations to real-world scenarios like traffic flow, electrical networks, curve fitting etc so as to solve them.	
9	**Modules: -** **Module 1: Arithmetic** • Sequences: Arithmetic sequences and Geometric sequences, its applications. • Linear equations in one variable and its applications (word problems).	

	• Quadratic equations and its applications (word problems). • Graphing linear equations and straight line depreciation using slope-point form, Graphs of inequalities and its applications to Linear Programming. • Applications of exponential functions to Radioactive decay, Oceanography, Malthusian Population Growth, Epidemiology, The Malthusian theory etc. • Applications of Logarithmic functions to electrical engineering, Geology, charging batteries, population doubling time, isothermal expansion, pH scale, Electronics, Physiology, carbon-14 dating, population growth, etc.	
	Module 2: Polynomial equations and Matrices • Solving polynomial equations: zero of a polynomial, Remainder theorem, Factor theorem, synthetic division, fundamental theorem of Algebra, conjugate pairs theorem, Descartes rule of signs, intermediate value theorem (location of roots) for polynomials with real coefficients (proofs of theorems mentioned are not expected). • Matrices: Matrix and its determinant, types of matrices, algebra of matrices, elementary row operations, Row echelon form and reduced row echelon form of a matrix, rank of a matrix, system of homogeneous and non-homogeneous linear equations, Its matrix representation, Augmented matrix, solving system of linear equations by Gaus elimination method & Gauss- Jordan elimination method, inverse of a matrix, matrix inversion method to find inverse of a matrix (if exists). Applications of system of linear equations to 1) Electrical networks, 2) Traffic flow, 3) Curve fitting, 4) Leontief input-output model in economics etc	
10	**Text Books** 1. College Algebra, 7th edition, R. David Gustafson and Peter D. Frisk, . Brooks/Cole., 2000. **2.** Linear Algebra with applications, 9th edition, Gareth Williams, Jones and Bartlett Learning, 2019.	
11	**Reference Books** 1. Algebra for college students, 6th edition, Jerome E. Kaufmann and Karen . Schwitters, Brooks/Cole, 1999. 2. Linear Algebra and its applications, 3rd edition, David C. Lay, Pearson, 2020	
	<u>Scheme of the Examination</u>	
	The performance of the learners shall be evaluated into two parts. • Internal Continuous Assessment of 20 marks for each paper. • Semester End Examination of 30 marks for each paper. • Separate head of passing is required for internal and semester end examination.	
12	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**

13 **Continuous Evaluation through:** Quizzes, Class Tests, presentations, projects, role play, creative writing, assignments etc.
(at least 3)

Sr. No.	Particulars	Marks
1	A class test of 10 marks is to be conducted during each semester in an Offline mode.	10
2	Project on any one topic related to the syllabus or a quiz (offline/online) on one of the modules.	05
3	Seminar/ group presentation on any one topic related to the syllabus.	05

Paper pattern of the Test (Offline Mode with One hour duration):
Q1: Definitions/Fill in the blanks/
True or False with Justification.
(04 Marks: 4 x 1).
Q2: Attempt any 2 from 3
descriptive questions. (06 marks: 2 × 3)

14 **Format of Question Paper:**
The semester-end examination will be of 30 marks of one hour duration covering the entire syllabus of the semester.

Note: Attempt any TWO questions out of THREE.			
Q.No.1	Module 1 and 2	Attempt any **THREE** out of **FOUR**. (Each question of 5 marks) (a) Question based on OC1 (b) Question based on OC2 (c) Question based on OC3 (d) Question based on OC4	15 Marks
Q.No.2	Module 1 and 2	Attempt any **THREE** out of **FOUR**. (Each question of 5 marks) (a) Question based on OC1 (b) Question based on OC2 (c) Question based on OC3 (d) Question based on OC4	15 Marks

		Q.No.3	Module 1 and 2	Attempt any **THREE** out of **FOUR**. (Each question of 5 marks) (a) Question based on OC1 (b) Question based on OC2 (c) Question based on OC3 (d) Question based on OC4	15 Marks	

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BOS in Mathematics

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