As Per NEP 2020

University of Mumbai

Syllabus for Basket of OE	
Board of Studies in Mathematics	
UG First Year Programme	
Semester	**II**
Title of Paper	**Credits 2/ 4**
I) **Financial Mathematics II**	2
From the Academic Year	**2024-25**

Sr. No.	Heading	Particulars
1	**Description the course:** **Including but not limited to:**	This course offers a comprehensive exploration of finance and statistical analysis. It covers essential topics such as shares, mutual funds, time series analysis, and index numbers. Students learn about shares and mutual funds, including concepts like face value, market value, and dividends, and how to calculate net income considering various factors. Additionally, they delve into time series analysis, where they explore trend estimation methods like Moving Average and Least Squares, and forecasting techniques using the Least Squares Method. The significance of index numbers in economic analysis is also emphasized, providing students with practical skills and knowledge applicable to real-world scenarios in finance and statistics.
2	**Vertical:**	OE
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):** (List the course objectives) This course takes a comprehensive look at important ideas in finance and statistical analysis. Students learn about the complexities of financial instruments like stocks and mutual funds, as well as the principles of time series analysis and index numbers, throughout this course. CO1: To offer a thorough understanding of shares and mutual funds, including their types, components and calculations. CO2: To learn the concepts of time series and index numbers, including trend estimation methods and forecasting techniques. CO3: To develop proficiency in calculating various index numbers and understanding their significance in economic analysis. CO4: To acquire skills in averaging prices through Systematic Investment Plan (SIP) and interpreting its implications in mutual fund investments.	
8	**Course Outcomes (OC):**	

	After completion of the course, students will be able to. OC1: demonstrate a comprehensive understanding of financial instruments such as shares and mutual funds, enabling them to make informed investment decisions. OC2: calculate various index numbers, enabling them to measure price changes and cost of living accurately. OC3: apply statistical tools such as averaging prices through SIP in mutual fund investments, enhancing their practical understanding of financial markets. OC4: analyze time series data and estimating trends using appropriate statistical methods. OC5: develop the ability to forecast future trends using the Least Squares Method, enhancing their predictive capabilities.
9	**Modules:-** **Module 1: Shares and Mutual Funds:** - Concepts of shares, face value, market value, dividend, equity shares preferential shares, bonus shares, Simple examples. - Mutual Funds, Simple problems on calculation of Net Income after considering entry load, dividend, change in Net Asset Value (N.A.V) and exit load. - Averaging of price under the 'Systematic Investment Plan (S.I.P)'.
	Module 2: Time Series and Index Numbers - Concept and Components of time series. Estimation of Trend using Moving Average Method & Least Squares Method (only Linear Trend). - Concept of Forecasting using Least Squares Method. - Concept and uses of Index Numbers. Simple and Composite Index Nos. (unweighted, weighted). - Laspeyre's Price Index No., Paasche's Price Index No. Fisher's Price Index No., Dorbish-Bowley's Index Number, Marshall and Edgeworth Index Number. - Cost of Living Index No., Real Income
10	**Text Books** 1. Fundamentals of Mathematical Statistics,12th Edition, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2020. 2. Statistics for Business and Economics, 11th Edition, David R. Anderson, Dennis J. Sweeney and Thomas A. Williams, Cengage Learning, 2011. 3. Introductory Statistics, 8th Edition, Prem S. Mann, John Wiley & Sons Inc., 2013.
11	**Reference Books** 1. A First Course in Statistics, 12th Edition, James McClave and Terry Sincich, Pearson Education Limited, 2018. 2. Introductory Statistics, Barbara Illowsky, Susan Dean and Laurel Chiappetta, OpenStax, 2013.
	Scheme of the Examination
	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%** **Semester End Examination: 60%**	
13	**Continuous Evaluation through:** Quizzes, Class Tests, presentations, projects, role play, creative writing, assignments etc. (at least 3) <table><tr><td>Sr. No.</td><td>Particulars</td><td>Marks</td></tr><tr><td>1</td><td>A class test of 10 marks is to be conducted during each semester in an Offline mode.</td><td>10</td></tr><tr><td>2</td><td>Project on any one topic related to the syllabus or a quiz (offline/online) on one of the modules.</td><td>05</td></tr><tr><td>3</td><td>Seminar/ group presentation on any one topic related to the syllabus.</td><td>05</td></tr></table> **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 $\times$ 3)	

14	**Format of Question Paper:**
	The semester-end examination will be of 30 marks of one hour duration covering the entiresyllabus 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/OC2
		     (b) Question based on OC3
		     (c) Question based on OC4
		     (d) Question based on OC5
			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/OC2
		     (b) Question based on OC3
		     (c) Question based on OC4
		     (d) Question based on OC5
			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/OC2
		   (b) Question based on OC3
		   (c) Question based on OC4
		   (d) Question based on OC5
			15 Marks

Sign of the BOS Chairman
Dr. Bhausaheb S Desale
The Chairman, Board of Studies in Mathematics

Sign of the Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science & Technology

Sign of the Offg. Dean
Prof. Shivram S. Garje
Faculty of Science & Technology

As Per NEP 2020

University of Mumbai

Syllabus for Basket of OE (Scheme I)	
Board of Studies in Mathematics	
UG First Year Programme	
Semester	II
Title of Paper	Credits
1. Quantitative Techniques – II	2
2.	
3.	
From the Academic Year	2024-25

Name of the Course: Quantitative Techniques – II (OE – I)

Sr. No.	Heading	Particulars
1	**Description the course:** **Including but Not limited to:**	This course deals with the Basic Mathematics that forms an essential component of Most of the Competitive and Entrance Examinations, such as Banking, Management Entrance, UPSC/MPSC, SET/NET, GMAT/GRE to quote a few. Although the Math-concepts involved in these examinations are of elementary level, the nature of the problems in such exams is far different, and the difficulty level of the questions is much higher, than the typical ones, based on which students are tested in schools. A person appearing for such exams is expected to have a thorough understanding of the concepts, to have ability to think logically, and to be able to interpret the data, presented in different manner.
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 revises the basic mathematical concepts learned during school career. However, the problems asked in this course would be mostly advanced and indirect, and would demand broader and critical thinking. The course aims to enhance the reasoning power and logical thinking of the learners and nurture their intellect so as to make them competent across all competitive exams. CO1. To reinforce the basic math concepts and ideas within the learners CO2. To improve the cognitive power of the learners and make them think over and apply concepts/formulae to solve math problems of indirect nature, thereby developing their problem-solving capacity. CO3. To develop rational thinking of the learners CO4. To make learners competent across all competitive and entrance examinations	
8	**Course Outcomes (OC):** After completion of the course, learners will be able to	

	OC1: understand the difference between equations and inequalities OC2: learn the concepts related to linear and quadratic equations, such as roots and their nature in different situations. OC3: realize how to perform various operations (such as addition, subtraction, multiplication and division) on inequalities and grasp their consequences. OC4: understand the difference between permutations and combinations OC5: learn the concepts and theorems related to probability, such as addition rule, multiplication rule, independent events. OC6: realize the various formulae and their applications in finding area and perimeter of various geometric shapes

9	**Modules:-**
	
	Module 1: Equations and Inequalities
	
	1. Equations - I
	• Linear Equation in one variable
	• Linear Equation in two variables
	• Simultaneous Equations in two and three variables
	• Forming simultaneous equations
	
	2. Equations - II
	• Quadratic Equation in one variable
	• Methods of solving a quadratic equation, such as (a) factorization, (b) technique of completing square, (c) use of the formula $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
	• Discriminant and Nature of the roots of a quadratic equation
	• Equations of higher degree and solving the same, when one root is given/known. Use of synthetic division
	
	3. Inequalities
	• Concept of inequality, types of inequality such as $<, >, \leq, \geq$.
	• Simple rules related to inequality such as
	    o Adding same quantity to both sides doesn't alter inequality
	    o Subtracting same quantity from both sides doesn't alter inequality
	    o Multiplying both sides by same positive quantity doesn't alter inequality
	    o Dividing both sides by same positive quantity doesn't alter inequality
	    o Multiplication or Division by negative quantities alter inequality
	
	[The problems to be asked should be of varied levels of difficulty. A few ones based on directly applying a given formula may be asked at the beginning; however, the latter ones should demand critical analysis of the given information and a thoughtful selection of the method/formula to solve the same.]

	Module 2: Counting Techniques, Probability and Geometry 1. Permutations and Combinations • The idea of Permutations and Combinations

	• The factorial notation and formulae for $P(n,r)$ and $C(n,r)$
	
	 2. Probability
	
	      • The concept and definition of Probability
	      • The addition rule in Probability
	      • The multiplication rule (in case of independent events) in Probability
	
	 3. Geometry
	
	      • Formulae for the area and perimeter of various standard geometric shapes, such as triangles and quadrilaterals.
	      • Using area of triangle to obtain areas of non-standard shape
	      • Relation of internal/external angle and the number of sides of a regular polygon
	      • Circumference and Area of a circle

10	**Text Books** 1. Bible To Basic Mathematics**,** Pragati Agarwal 2. Quantitative Aptitude for Competitive Examinations, R. S. Agarwal 3. Logical and Analytical Reasoning: Useful for All Competitive Exams, A. K. Gupta
11	**Reference Books** 1. Arithmetic : Subjective And Objective For Competitive Examinations, R. S. Agarwal 2. Maths Book For Competitive Exams, Vikas Bhalla **3.** Reasoning For Competitive Examinations, Nishit K Sinha
	<u>Scheme of the Examination</u>

	The performance of the learners shall be evaluated into two parts.
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Sr. No.	Particulars	Marks
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		    (b) Question based on OC3
		    (c) Question based on OC4
		    (d) Question based on OC5/OC6
			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/OC2
		    (b) Question based on OC3
		    (c) Question based on OC4
		    (d) Question based on OC5/OC6
			15 Marks

Q.No.3	Module 1 and 2	Attempt any **THREE** out of **FOUR**. (Each question of 5 marks)	15 Marks

		(a) Question based on OC1/OC2 (b) Question based on OC3 (c) Question based on OC4 (d) Question based on OC5/OC6	

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