AC: 02.06.2025 ITEM NO: 23.1

Deccan Education Society's

Kirti M. Doongursee College of Arts, Science and Commerce (AUTONOMOUS)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for

Program: Bachelor of Science

Course: F.Y.B.SC. (Semester I&II)

Subject: Mathematics

Choice Based Credit System (CBCS)
with effect from
Academic Year 2024-2025

PROGRAM OUTCOMES

PO	Description
A student completing Bachelor's Degree in **Science** Program will be able to	
PO1	**Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate Programme. Execute strong theoretical and practical understanding generated from the specific graduate Programme in the area of work.
PO2	**Critical Thinking and Problem solving:** Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	**Social competence:** Display the understanding, behavioral skills needed for successful social adaptation, work in groups, exhibits thoughts and ideas effectively in writing and orally.
PO4	**Research-related skills and Scientific temper:** Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	**Trans-disciplinary knowledge:** Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem.
PO6	**Personal and professional competence:** Performing dependently and collaboratively as a part of team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	**Effective Citizenship and Ethics:** Demonstrate empathetic social concern and equity centered national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	**Environment and Sustainability:** Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

Deccan Education Society's

Kirti M. Doongursee College (autonomous)

Proposed Curriculum as per NEP 2020 Year of implementation- 2024-25

Name of the Department: Mathematics

Semester	Course Code	Course Title	Vertical	Credit
I	24MATMJ111	Calculus –I and Algebra -I	Major	2
	24MATMJP11	Practical : Calculus –I and Algebra -I	Major practical	2
	24MATOE131	Mathematical and Statistical Techniques-I	OE	2
	24MATVC141	Microsoft word and Power point	VSC practical	2
	24MATSC151	Quantitative Aptitude and Logical reasoning -I	SEC practical	2
II	24MATMJ211	Calculus – II and Discrete Mathematics	Major	2
	24MATMJP21	Practical : Calculus – II and Discrete Mathematics	Major practical	2
	24MATOE231	Mathematical and Statistical Techniques-II	OE	2
	24MATVC241	Advanced Excel	VSC practical	2
	24MATSC251	Quantitative Aptitude and Logical reasoning -II	SEC practical	2

Semester -I

Course Code	MAJOR I	Credits	Lectures /Week
24MATMJ111	PAPER I : CALCULUS –I AND ALGEBRA -I	2	2

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Define bounded sets, Infimum and supremum, sequences, Divisibility of integers, congruences, functions, relations.

CO2:Explain real numbers and its various properties, sequences and its convergence, properties of divisibility , congruence modulo n .

CO3:Apply various properties of real numbers, standard theorems of sequences and subsequences, properties of divisibility, congruences by employing suitable algorithms and theorems to solve related problems .

CO4:Examine boundedness of a sequence, convergence of sequences, congruence, residue classes in integers.

Unit	Topics	No of Lectures
I	**Calculus –I** **a)Real Number System** i) Real number system R and order properties of R, absolute value || and its peoperties. ii) AM-GM inequality, Cauchy-Schwarz inequality, Intervals and neighbourhoods , Interior points, Limit point, Hausdorff property. iii) Bounded sets, Statements of l.u.b. axiom and its consequences, Supremum and infimum, Maximum and minimum, Archimedean property and its applications, Density of rationals. **b)Sequences in R** i) Definition of sequence and examples, Convergence of sequences, and its properties. Divergent sequences. ii) Convergence of standard sequences like $\left(\frac{1}{1+na}\right) \forall\, a > 0$, $\left(b^n\right) \forall b$, $0 < b < 1$, $\left(c^{\frac{1}{n}}\right) \forall\, c > 0$ and $\left(n^{\frac{1}{n}}\right)$. iii) Algebra of convergent sequences, Sandwich theorem, Monotone convergence theorem and consequences of $\left(\left(1+\frac{1}{n}\right)^n\right)$. iv) Definition of subsequence, Subsequence of a convergent sequence,Cauchy sequences, Every convergent sequences is a Cauchy sequence and converse.	15
II	**Algebra -I** **a)Integers & Divisibility**	15

	i) Statements of well-ordering property of non-negative integers, Divisibility in integers, division algorithm, greatest common divisor (g.c.d.) and least common multiple (l.c.m.) of two non zero integers and properties , Expression of g.c.d. in the form of ma + nb for some m, n ∈ Z, Euclidean algorithm. ii) Primes, Euclid's lemma, Fundamental Theorem of arithmetic, The set of primes is infinite, there are arbitrarily large gaps between primes, there exists infinitely many primes of the form 4n − 1 or of the form 6n − 1. iii) Congruence, definition and elementary properties, Results about linear congruence equations. Examples. **b)Functions, Relations and Binary Operations** (Prerequisites: Definition of relation and function, domain, co-domain and range of a function, composite functions, injective, surjective, bijective functions, examples) i) Binary operation, properties, examples. Equivalence relation, Equivalence classes and its properties Definition of partition, every partition gives an equivalence relation and vice versa. ii) Congruence is an equivalence relation on Z, Residue classes and partition of Z, Addition and Multiplication modulo n, examples. Direct image f(A) and inverse image f^{-1}(B) for a function f, Composite of injective, surjective, bijective functions when defined, invertible functions, bijective functions are invertible and conversely, examples of functions including constant, identity, projection, inclusion, Binary operation as a function.	

References:

1. R. G. Bartle- D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons, 1994.
2. K. G. Binmore, Mathematical Analysis, Cambridge University Press, 1982.
3. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
4. Sudhir Ghorpade and Balmohan Limaye, A course in Calculus and Real Analysis, Springer International Ltd, 2000.
5. David M. Burton, Elementary Number Theory, Seventh Edition, McGraw Hill Education (India) Private Ltd.
6. Norman L. Biggs, Discrete Mathematics, Revised Edition, Clarendon Press, Oxford 1989

Additional References:

1. T. M. Apostol, Calculus Volume I, Wiley & Sons (Asia) Pte, Ltd.
2. Richard Courant-Fritz John, A Introduction to Calculus and Analysis, Volume I, Springer.
3. Ajit kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, 2014.
4. James Stewart, Calculus, Third Edition, Brooks/ cole Publishing Company, 1994.
5. A Treatise on Differential Equations, MacMillan and Co.,1956
6. I. Niven and S. Zuckerman, Introduction to the theory of numbers, Third Edition, Wiley Eastern, New Delhi, 1972.
7. G. Birkoff and S. Maclane, A Survey of Modern Algebra, Third Edition, Mac Millan, New York, 1965.
    a. N. S. Gopalkrishnan, University Algebra, Ne Age International Ltd, Reprint 2013.

Course Code	MAJOR I – PRACTICAL	Credits	Lectures/ Week
24MATMJP11	CALCULUS –I AND ALGEBRA –I	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Describe various properties of real numbers, standard theorems of sequences and subsequences

CO2: Discuss problems of divisibility, congruences by employing suitable algorithms and theorems .

CO3: Solve the problems based on the syllabus.

CO4: Relate mathematics and its applications in pure and applied sciences.

Sr. No.	Practical's details	No of Lectures/ Hours
1	Algebraic and Order Properties of Real Numbers and Inequalities	60
2	**AM-GM inequality, Cauchy-Schwarz inequality, Interior point , Limit point.**	
3	**Hausdorff Property and LUB Axiom of R, Archimedian Property**	
4	Convergence and divergence of sequences, bounded sequences, Divergent sequence.	
5	Algebra of Convergent sequences, Sandwich Theorem.	
6	Cauchy sequences, monotonic sequences, non-monotonic sequences.	
7	Miscellaneous theory questions on unit I	
8	Division Algorithm, Euclidean algorithm in Z, Examples on expressing the gcd. of two non zero integers a&b as ma + nb for some m, n ∈ Z,	
9	Primes and the Fundamental theorem of Arithmetic, Euclid's lemma, there exists infinitely many primes of the form 4n − 1 or of the form 6n − 1	
10	Congruence, linear congruence equations.	
11	Binary Operation, Equivalence Relations, Partition and Equivalence classes	
12	**Congruence , Residue classes,** partition of Z, Addition modulo n, Multiplication modulo n,	
13	Bijective and Invertible functions, Compositions of functions.	
14	Miscellaneous theory questions on unit II	

References:

1. R. G. Bartle- D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons, 1994.
2. K. G. Binmore, Mathematical Analysis, Cambridge University Press, 1982.
3. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
4. Sudhir Ghorpade and Balmohan Limaye, A course in Calculus and Real Analysis, Springer International Ltd, 2000.
5. David M. Burton, Elementary Number Theory, Seventh Edition, McGraw Hill Education (India) Private Ltd.
6. Norman L. Biggs, Discrete Mathematics, Revised Edition, Clarendon Press, Oxford 1989

Additional References:

1. T. M. Apostol, Calculus Volume I, Wiley & Sons (Asia) Pte, Ltd.
2. Richard Courant-Fritz John, A Introduction to Calculus and Analysis, Volume I, Springer.
3. Ajit kumar and S. Kumaresan, A Basic Course in Real Analysis, CRC Press, 2014.
4. James Stewart, Calculus, Third Edition, Brooks/ cole Publishing Company, 1994.
5. A Treatise on Differential Equations, MacMillan and Co.,1956

Course Code	Open Elective	Credits	Lectures/Week
24MATOE131	**Mathematical and Statistical Techniques-I**	**2**	**2**

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Define various terms in shares, mutual funds, permutation, combinations,measures of dispersion and probability.

CO2: Explain the fundamental concepts of shares and mutual funds, , permutation, combinations,measures of dispersion and probability.

CO3:Solve simple problems based on shares, mutual funds, permutation, combinations,measures of dispersion and probability.

CO4:Evaluate the risk and return profiles of individual stocks and mutual funds using performance,problems based on permutation, combinations,measures of dispersion and probability.

Unit	Topics	No of Lectures
I	(a)Basics of Shares and Mutual Funds Shares: Concept of share, 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.) (b)Permutations , Combinations and Linear Programming Problems: Factorial notation,Fundamental principle of counting. Permutations as arrangement simple examples, combinations as selection simple examples . Linear Programming Problem : Sketching of Graphs of a) Linear equations AX+BY+C=0 b) Mathematical formulation of Linear Programming Problem up-to 2 variables. Solving Linear Programming Problem by graphical method up-to 2 variables.	**15**
II	(a) Measures of Central Tendencies: Definition of Average, Types of Averages: Arithmetic Mean, Median, and Mode for grouped as well as ungrouped data, Combined and Weighted mean. Quartiles for grouped data. Measures of Dispersions: Concept and idea of dispersion.	**15**

	Various measures Range, Quartile Deviation, coefficient of quartile deviation, Mean Deviation, coefficient of mean deviation , Standard Deviation, Variance, Combined Variance, Coefficient of variation. (b)Elementary Probability Theory Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events. Classical definition of Probability, Addition theorem (without proof), conditional probability. Independence of Events: $P(A \cap B) = P(A) P(B)$. Simple examples.	

References:

1. **Mathematical and Statistical Techniques-I, by Sheth Publication .**
2. **Mathematical and Statistical Techniques-I, by Manan Prakashan .**
3. A class textbook of Business Mathematics by Padmalochan Hazarika S.Chand Publications New Delhi.

Additional References:

1. Basics of Business Mathematics Schaums Outline Series.
2. Fundamentals of mathematical Statistics , Sultan chand & sons, S.C. Gupta, V.K.Kapoor.

Course Code	VOCATIONAL SKILL COURSE	Credits	Lectures/ Week
24MATVC141	MICROSOFT WORD AND POWER POINT	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Describe the names and functions of the word and power point interface components.

CO2:Explain edit, save, print documents format document using word and power point.

CO3:Apply formatting techniques and presentation styles.

CO4:Organize document and slide presentations that include text, graphics, animation, and transitions.

Sr. no.	Practical's Details:	No of Lectures / Hours
1	**Microsoft word** :Text Basics, Text Formatting and saving file	60
2	Working with Objects, Header & Footers	
3	Bullets and Numbering, Working with Tables	
4	Proofing the document, Sharing and Maintaining Document	
5	Revision practical on Microsoft word.	
6	**Power point** :Setting Up PowerPoint Environment, Formatting Text	
7	Creating slides and applying themes, Working with bullets and numbering	
8	Working with Objects	
9	Inserting Hyperlinks and Action Buttons , Edit Hyperlinks and Action Button	
10	Using SmartArt and Tables	
11	Animation and Slide Transition	
12	Slide show option, Creating custom slide show	
13	Proofing and Printing	
14	Revision practical on Power point.	

Reference books:

1. Microsoft Office 365: In Practice, 2021 Edition, By Randy Nordell, Kathleen Stewart, Annette Easton, Pat Graves Mc Grow Hill Publication
2. **Microsoft word in easy steps by Scott Basham**
3. Microsoft power point guide to success by Kelvin Pitch
4. Microsoft power point best practices , tips and techniques by Chantal Bosse

Additional References:

1. **Learning Ms. Word and Ms Excel by Rohit Khurana**
2. Microsoft power point basics by Angela Rose

Course Code	SKILL ENHANCEMENT COURSE	Credits	Lectures/ Week
24MATSC151	QUANTITATIVE APTITUDE AND LOGICAL REASONING -I	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Define different types of numbers , factors and multiples of numbers , LCM and GCD of numbers, BODMAS rule, tabulation, logical reasoning .

CO2:Describe number system , BODMAS rule, factors and multiples of numbers , LCM and GCD of numbers the numbers , various properties of divisibility, data Interpretation and logical reasoning .

CO3:Solve problems of divisibility,square and square roots, cube and cube roots,division and euclidean algorithms , HCF and LCM of numbers , Simplifications using BODMAS , data Interpretation and logical reasoning problems.

CO4:Illustrate techniques involved in solving mathematical problems and thereby reducing the time taken for performing related calculation .

Sr. no.	Practical Detail:	No of Lectures/ Hours
1	**Number System : Number line and classification of numbers, Face value and Place value of a digit in a number**	60
2	**squares and square roots , cube and cube roots**	
3	**prime numbers, test for an number to be a prime, Tests of divisibility**	
4	**Factorial of a number ,Modulus of a number , Greatest integral value, multiplication by short cut methods**	
5	**Division and Euclidean algorithms.**	
6	**Simplifications using BODMAS: simple problems**	
7	**Modulus of a real number, problems by using formulae like** $(a+b)^2, (a-b)^2, a^2-b^2, (a+b)^3, \left(a^3-b^3\right), (a+b+c)^2\ etc$	
8	**HCF and LCM of numbers: Factors and Multiples**	
9	**HCF of two or more than two numbers by factorization method and by division method**	
10	**LCM by factorization and by short method,product of two numbers in terms of HCF and LCM**	
11	Coprime numbers, HCF and LCM of fractions, Decimal fractions and comparison of fraction.	

12	**Data Interpretation: Tabulation and bar graphs related problems.**	
13	**Logical Reasoning:** Important concepts in Logical Reasoning simple problems	
14	**Logical reasoning based on arrangements, Logical reasoning based on ranking, Quantitative reasoning, Puzzle test, Syllogisms**	

Reference books:

1. **Quantitative Aptitude for competitive examinations by Dr. R.S.Aggarwal S.Chand Publication**
2. **Quantitative Aptitude for the CAT by Arun Sharma , TATA McGRAW-HILL's Series.**

Additional References:

1. **Quantitative Aptitude for competitive examinations by Abhijit Gupta TATA McGRAW-HILL Publishing company limited, New Delhi.**
2. **Quantitative Aptitude by P.R. Vittal pearson education Publication.**

Semester -II

Course Code	MAJOR -I	Credits	Lectures /Week
24MATMJ211	CALCULUS – II AND DISCRETE MATHEMATICS	2	2

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Define limit, continuity , convergence and divergence series, Finite and infinite sets,. Pigeonhole principle, Permutation, Principal of inclusion and exclusion principle , derangements and eulers phi function.

CO2: Explain limit, continuity , convergence and divergence series, Finite and infinite sets,. Pigeonhole principle, Permutation, Principal of inclusion and exclusion principle , derangements and eulers phi function.

CO3: Apply various properties of limits, continuity, convergence and divergence series, Finite and infinite sets,. Pigeonhole principle, Permutation, Principal of inclusion and exclusion principle , derangements and Euler's -phi- function to solve related problems.

CO4: Examine limit , continuity , convergence and divergence series ,countable and uncountable sets, various counting principals and solve related problems.

Unit	Topics	No of Lectures
I	**Calculus – II** **a)Limits and Continuity** {Brief review: Domain and range of a function, injective function, surjective function, bijective function, composite of two functions (when defined), Inverse of a bijective function. Graphs of some standard functions such as $\|x\|$, e^x, $log\, x$, $ax^2 + bx + c$, $\frac{1}{x}$, x^n $n \geq 3$,sin x, cos x, tan x, $\sin\left(\frac{1}{x}\right)$, $x^2 \sin\left(\frac{1}{x}\right)$ over suitable intervals of R. No direct questions to be added. } i) ε − δ definition of Limit of a function, uniqueness of limit if it exists, algebra of limits, limits of composite function, sandwich theorem, left-hand-limit $f(x)$, right-hand-limit $f(x)$, non-existence of limits, $f(x)$, $f(x)$, $f(x)$, $= \pm \infty$. ii) Continuous functions: Continuity of a real valued function at a point, on a set and at end points of domain using ε− δ definition, examples, f is continuous at a if and only if $f(x)$ exists and equals to f(a), Sequential continuity, Algebra of continuous functions, discontinuous functions, examples of removable and essential discontinuity. iii)Intermediate Value theorem and its applications, Bolzano-Weierstrass theorem (statement only): A continuous	15

	function on a closed and bounded interval is bounded and attains its bounds. **b)Infinite Series** i). Infinite series in R. Definition of convergence and divergence series. Basic examples including geometric series. Elementary results such as if $\sum_{n=1}^{\infty} a_n$ is convergent, then $a_n \to 0$ as $n \to \infty$ but converse is not true. Cauchy Criterion. Algebra of convergent series. ii). Tests for convergence: Comparison Test, Limit Comparison Test, Ratio Test (without proof), Root Test (without proof), Abel Test (without proof) and Dirichlet Test (without proof). Examples. The decimal expansion of real numbers. Convergence of $\sum_{n=1}^{\infty} \frac{1}{n^p}$ (p > 1). Divergence of harmonic series $\sum_{n=1}^{\infty} \frac{1}{n}$. iii)Alternating series. Leibnitz's Test. Examples. Absolute convergence, absolute convergence implies convergence but not conversely. Conditional Convergence.	
II	**Discrete Mathematics** **Preliminary Counting** i) Finite and infinite sets, countable and uncountable sets examples such as N, Z, N × N, Q,(0, 1), R. ii) Addition and multiplication Principle, counting sets of pairs, two ways counting. iii)Pigeonhole principle simple and strong form and examples, its applications to geometry. **Advanced Counting** i) Permutation and combination of sets and multi-sets, circular permutations, emphasis on solving problems. ii) Binomial and Multinomial Theorem, Pascal identity, examples of standard identities such as the following with emphasis on combinatorial proofs iii) Non-negative integer solutions of equation $x_1 + x_2 + x_3 + ... + x_k = n$. iv) Principal of inclusion and exclusion, its applications, derangements, explicit formula for dn, deriving formula for Euler's function φ(n).	**15**

References:

1. R. G. Bartle- D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons, 1994.
2. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
3. James Stewart, Calculus, Third Edition, Brooks/ Cole Publishing company, 1994.
4. T. M. Apostol, Calculus, Vol I, Wiley And Sons (Asia) Pte. Ltd
5. Sudhir Ghorpade and Balmohan Limaye, A course in Calculus and Real Analysis,

Springer International Ltd, 2000.
6. Norman Biggs, Discrete Mathematics, Oxford University Press.
7. V. Krishnamurthy, Combinatorics-Theory and Applications, Affiliated East West Press.
8. Discrete Mathematics and its Applications, Tata McGraw Hills.
9. Sharad Sane, Combinatorial Techniques, Springer.

Additional References:

1. Richard Courant and Fritz John, A Introduction to Calculus and Analysis, Volume-I, Springer.
2. Ajit Kumar and S. Kumaresan, A Basic course in Real Analysis, CRC Press, 2014.
3. K. G. Binmore, Mathematical Analysis, Cambridge University Press, 1982.
4. G. B. Thomas, Calculus, 12th Edition 2009
5. Schaum's outline series, Discrete mathematics,
6. Allen Tucker, Applied Combinatorics, John Wiley and Sons.
7. Richard Brualdi, Introductory Combinatorics, John Wiley and sons.

Course Code	MAJOR I – PRACTICAL	Credits	Lectures/ Week
24MATMJP21	PAPER-I :CALCULUS– II AND DISCRETE MATHEMATICS	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Define various properties of limits, continuity, differentiability of a function and implicit differentiation of functions to solve related problems.

CO2:Explain various properties of limits, continuity, convergence and divergence series, Finite and infinite sets,. Pigeonhole principle, Permutation, Principal of inclusion and exclusion principle , derangements and Euler's -phi- function to solve related problems.

CO3:Use limit , continuity , convergence and divergence series ,countable and uncountable sets, various counting principals to solve related problems.

CO4:Relate and apply concepts of mathematics in related disciplines.

Sr.no.	Practical detail	No of Lectures / Hours
1	Limit of a function and Sandwich theorem, Algebra of limits.	60
2	Algebra of continuous functions, Intermediate Value theorem, Bolzano Weierstrass theorem. Continuous and discontinuous function.	
3	Properties of differentiable functions, derivatives of inverse functions and implicit functions.	
4	Chain Rule, Higher order derivatives	
5	Leibnitz Rule, Derivative of inverse functions, Implicit differentiation.	
6	Mean value theorems and its applications	
7	Miscellaneous theory questions on unit I	
8	Finite and infinite sets, countable and uncountable sets	
9	Counting principles, Two way counting.	
10	Pigeon hole principle.	
11	Multinomial theorem, identities, permutation and combination of multi-set.	
12	Non-negative integer solutions of equation $x1 + x2 + \cdots + xk = n$.	
13	Inclusion-Exclusion principle. Euler phi function.	
14	Miscellaneous theory questions on unit II	

References:

1. R. G. Bartle- D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons,

1994.
2. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
3. James Stewart, Calculus, Third Edition, Brooks/ Cole Publishing company, 1994.
4. T. M. Apostol, Calculus, Vol I, Wiley And Sons (Asia) Pte. Ltd
5. Sudhir Ghorpade and Balmohan Limaye, A course in Calculus and Real Analysis, Springer International Ltd, 2000.
6. Norman Biggs, Discrete Mathematics, Oxford University Press.
7. V. Krishnamurthy, Combinatorics-Theory and Applications, Affiliated East West Press.
8. Discrete Mathematics and its Applications, Tata McGraw Hills.
9. Sharad Sane, Combinatorial Techniques, Springer.

Additional References:

1. Richard Courant and Fritz John, A Introduction to Calculus and Analysis, Volume-I,
Springer.
2. Ajit Kumar and S. Kumaresan, A Basic course in Real Analysis, CRC Press, 2014.
3. K. G. Binmore, Mathematical Analysis, Cambridge University Press, 1982.
4. G. B. Thomas, Calculus, 12th Edition 2009
5. Schaum's outline series, Discrete mathematics,
6. Allen Tucker, Applied Combinatorics, John Wiley and Sons.
7. Richard Brualdi, Introductory Combinatorics, John Wiley and sons.

Course Code	SEM – II Open Elective	Credits	Lectures/Week
24MATOE231	Mathematical and Statistical Techniques-II	2	2

Course Outcomes:

After successful completion of this course, students would be able to

CO1:Define functions, derivatives,correlation and regression.

CO2:Describe functions, derivatives,correlation and regression.

CO3:Solve simple problems on functions, derivatives,correlation and regression.

CO4:Calculate values of a function, derivative of a function,correlation and regression coefficients.

Unit	Topics	No of Lectures
I	Functions ,Derivatives of functions and their Applications: (a)Concept of real Functions: Constant function, linear function, $x^n, a^x, log\ x$. Demand, supply, total revenue, average revenue, total cost, average cost and profit function. (b)Derivatives of functions: Derivative of $x^n, a^x, e^x, log\ x$.Rules of derivative,simple problems, Second order derivative. Applications of derivative : Marginal cost,Marginal Revenue, Elasticity of demand, Maxima and Minima of functions.	15
II	Bivariate Linear correlation and regression (a) Correlation Analysis: Meaning, Types of correlation, Determination of correlation, Scatter diagram, Karl Pearson's and Spearmans rank correlation. (b) Regression Analysis: Meaning, Concept of Regression Equations, Slope of regression line and its interpretation, Regression coefficients, Relation ship between coefficient of correlation coefficients and regression coefficients. Finding the equations of regression lines by method of least squares.	15

References:

1. **Mathematical and Statistical Techniques-II, by Sheth Publication .**
2. **Mathematical and Statistical Techniques-II, by Manan Prakashan .**
3. A class textbook of Business Mathematics by Padmalochan Hazarika S.Chand Publications New Delhi.

Additional References:

1. Fundamental of mathematical Statistics , Sultan chand & sons, S.C. Gupta, V.K.Kapoor.
2. Basics of Business Mathematics Schaums Outline Series

Course Code	VOCATIONAL SKILL COURSE	Credits	Lectures/ Week
24MATVC241	ADVANCED EXCEL	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1: List large amount of data and apply various functions on it.
CO2: Express data list using outline, auto filter, pivot tables etc.
CO3: Choose advanced functions and productivity tools in developing worksheets.
CO4: Examine formulas , including the use of built in functions.

Sr. no.	Practical Detail:	No of Lectures/ Hours
1	Spreadsheet : (Creating and Navigating worksheets and adding information to worksheets) Types of data, entering different types of data such as texts, numbers, dates, functions.	60
2	Quick way to add data Auto complete, Autocorrect, Auto fill, Auto fit. Undo and Redo Moving data, contiguous and non-contiguous selections, Selecting with keyboard. Cut-Copy, Paste. Adding and moving columns or rows. Inserting columns and rows. Find and replace values. Spell check	
3	Formatting cells, Numbers, Date, Times, Font, Colors, Borders, Fills. Multiple Spreadsheets: Adding, removing, hiding and renaming worksheets	
4	Add headers/Footers to a Workbook. Page breaks, preview. Creating formulas, inserting functions, cell references, Absolute, Relative (within a worksheet, other worksheets and other workbooks).	
5	Functions: Financial functions: FV, PV, PMT, PPMT, IPMT, NPER, RATE, NPV, IRR	
6	Mathematical and statistical functions. ROUND, ROUNDDOWN, ROUNDUP, CEILING, FLOOR, INT, MAX, MIN, MOD, SQRT, ABS, AVERAGE.	
7	Data Analysis: Sorting, Subtotal. Pivot Tables- Building Pivot Tables, Pivot Table regions, Rearranging Pivot Table.	
8	Advanced Spreadsheet :Multiple Spreadsheets Creating and using templates Creating and Linking Multiple Spreadsheets, Using formulas and logical operators.	

9	Creating and using named ranges. Creating formulas that use reference to cells in different worksheets.	
10	Functions: Database Functions LOOKUP, VLOOKUP, HLOOKUP Conditional Logic functions IF, COUNTIF, SUMIF, AVERAGEIF, NESTED IF.	
11	String functions LEFT, RIGHT, MID, LEN, UPPER, LOWER, PROPER, TRIM.	
12	Date functions TODAY, NOW, DATE, TIME, DAY, MONTH, YEAR, WEEKDAY, DAYS360.Statistical Functions COUNTA, COUNTBLANK, CORREL, LARGE, SMALL.	
13	Data Analysis : Filter with customized condition.	
14	The Graphical representation of data Column, Line, Pie and Bar charts.	

References:

1. Computer system and applications by Dr. Faiyaz Gadiwala, Mukesh N. Tekwani, Sheth publishers PVT LTD.
2. Computer system and applications by Dr. Verus D'Sa, Manan Prakashan.

Additional References:

1. Micosoft Office Excel by Torben Lage Frandsen.
2. Excel Fundamentals by St. George's University of London.

Course Code	SKILL ENHANCEMENT COURSE	Credits	Lectures/ Week
24MATSC251	QUANTITATIVE APTITUDE AND LOGICAL REASONING -II	2	4

Course Outcomes:

After successful completion of this course, students would be able to

CO1: Define decimal fraction, common fraction ,Average, Surds and Indices , Logarithms, Percentage, weighted average of different groups, Data Interpretation and Logical Reasoning .

CO2: Describe decimal fraction, common fraction ,Average, Surds and Indices , Logarithms, Percentage, weighted average of different groups, Data Interpretation and Logical Reasoning

CO3: Solve problems of decimal fraction , common fraction , Average, Surds and Indices , Logarithms, Percentage, weighted average of different groups, Data Interpretation using pie chart and line graphs ,venn diagrams , sequence and series etc.

CO4: Illustrate various techniques involved in solving mathematical problems and thereby reducing the time taken for performing related calculation .

Sr. no.	Practical Details:	No of Lectures / Hours
1	**Decimal Fraction :Decimal fractions, Conversion of decimal fraction into common fractions.**	60
2	**Operations on decimal fraction(Addition , subtraction of decimal fraction, multiplication of decimal fraction by a power of 10)**	
3	comparison of fractions, recurring decimal ,pure recurring decimal, converting mixed decimal into common fraction.	
5	Average: Introduction , definition of average, weighted average,	
6	average of different groups , addition and removal of terms and change in average,	
7	replacement of some of the items ,some problem specific formulae, problems on ages.	
8	Surds and Indices: Law of indices, surds and law of surds.	
9	Logarithms: Logarithm, properties of logarithms,	
10	common logarithms, characteristics and mantissa.	
11	Percentage: Concept of percentage, results on population and results on depreciation.	
12	Data Interpretation : Pie charts and Line graphs related problems.	
13	Logical Reasoning: Set theory, Venn Diagrams and Network	

	Diagrams. Binary logic, Blood relations.	
14	Sequence and series.	

Reference books:

1. **Quantitative Aptitude for competitive examinations by Dr. R.S.Aggarwal S.Chand Publication**
2. **Quantitative Aptitude for the CAT by Arun Sharma , TATA McGRAW-HILL's Series.**

Additional References:

1. **Quantitative Aptitude for competitive examinations by Abhijit Gupta TATA McGRAW-HILL Publishing company limited, New Delhi.**
2. **Quantitative Aptitude by P.R. Vittal pearson education Publication.**

Evaluation Scheme for First Year (UG) under NEP (2 credits)

I. Internal Evaluation for Theory Courses – 20 Marks

1) Continuous Internal Assessment(CIA) Assignment - Tutorial/ Case Study/ Project / Presentations/– 10 marks

2) Continuous Internal Assessment(CIA) ONLINE Unit Test – 10 marks

II. External Examination for Theory Courses – 30 Marks

Duration: 1 Hours

Theory question paper pattern: All questions are compulsory.

Question	Based on	Marks
Q.1	Unit I	15
Q.2	Unit II	15

- All questions shall be compulsory with internal choice within the questions.
- Each Question may be sub-divided into sub questions as a, b, c, d, etc. & the allocation of Marks depends on the weightage of the topic.

III. Practical Examination

- Each core subject carries 50 Marks.
- Duration: 2 Hours for each practical course.
- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is necessary for appearing at the time of Practical Exam

NOTE: To pass the examination, attendance is compulsory in both Internal & External (Theory + Practical) Examinations.

IV. <u>PASSING STANDARD NEP First Year</u> :

· The learners /students shall obtain minimum of 40% marks in the Internal Assessment and External Assessment (Semester End Examination) COMBINED, to pass the course in a particular semester. A learner / student will be said to have passed the course if He/She passes the Internal Assessment + Semester End Examination COMBINED.

· To pass the examination attendance is compulsory in both internal and external (theory plus practical) examination.

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