Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

SU/BOS/Science/350 **Date: 24/06/2024**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

Subject: Regarding Minor Change syllabi of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref: SU/BOS/Science/876/ Date: 26/12/2023 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the Minor Change syllabi, nature of question paper of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Botany	9.	Geology
2.	Physics	10.	Zoology
3.	Statistics	11.	Chemistry
4.	Astrophysics	12.	Geography
5.	Mathematics	13.	Electronics
6.	Microbiology	14.	Drug Chemistry
7.	Plant Protection	15.	Industrial Microbiology
8.	Astrophysics and Space Science	16.	Sugar Technology (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	4	B.Sc. Exam/ Appointment Section
2	Director, Board of Examinations and Evaluation	5	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	6	Affiliation Section (U.G.) (P.G.)

SHIVAJI UNIVERSITY, KOLHAPUR.

Accredited By NAAC with 'A++' Grade

Structure and Syllabus in Accordance with

National Education Policy - 2020

with Multiple Entry and Multiple Exit

Bachelor of Science (Mathematics) Part I (Level-4.5)

Semester I and II

under the

Faculty of Science and Technology

(To Be Implemented from Academic Year 2024-25)

PROGRAM STRUCTURE:

Structure in Accordance with National Education Policy - 2020 With Multiple Entry and Multiple Exit Options B.Sc. (Mathematics) Part – I (Level-4.5)									
SEM (Level)	COURSES			**OE**	**VSC/SEC**	**AEC/VEC/IKS**	**OJT/FP/CEP /CC/RP**	**Total Credits**	**Degree/Cum. Cr. MEME**
	Course-1 Mathematics	**Course-2**	**Course-3**						
SEM – I (4.5)	DSC-I (2): Basic Algebra DSC-II (2): Calculus DSC P-I (2): Mathematics Practical - I	DSC-I(2) DSC-II (2) DSC P-I(2)	DSC-I(2) DSC-II (2) DSC P-I (2)	OE-1 (2) (T) Quantitative Aptitude for Competitive Examinations		IKS-I(2)		**22**	
SEM - II (4.5)	DSC-III (2) : Differential Equations - I DSC-IV (2) : Discrete Mathematics DSC P-II (2) : Mathematics Practical - II	DSC-III(2) DSC-IV (2) DSC P-II (2)	DSC-III (2) DSC-IV (2) DSC P-II (2)	OE-2 (2) (P) Practicals on Quantitative Aptitude		VEC-I(2) (Democracy, Election and Constitution)		**22**	**UG Certificate 44**
Credits	**8(T)+4(P)=12**	**8(T)+4(P)=12**	**8(T)+4(P)=12**	**2+2=4 (T/P)**	**--**	**2+2=4**	**--**	**44**	**Exit Option:4 credits NSQF/Internship/Skill courses**

Abbreviations:

AEC	Ability Enhancement Course
CC	Co-curricular Courses
CEP	Community Engagement and Service
DSC	Department Specific Core
DSE	Department Specific Elective
FP	Field Project
GE	Generic Elective
IDC	Inter-Disciplinary Course
IKS	Indian Knowledge System
MDC	Multi-Disciplinary Course
MIN	Minor
OE	Open Elective
OEC	Open Elective Course
OJT	On Job Training
P	Practical
RP	Research Project
SEC	Skill Enhancement Course
T	Theory
VEC	Value Education Course
VSC	Vocational Skill Course

Semester I

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – I)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type : DSC – I
Title of course : Basic Algebra
Credit : 02

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. apply De-Moivre's theorem.
CO 2. find rank, eigen values, eigen vectors of the matrix.
CO 3. solve system of linear homogeneous and non-homogeneous equations.
CO 4. understand Hermitian and Skew Hermitian matrices.

UNIT – 1: ALGEBRA OF COMPLEX NUMBERS (15 hrs.)

1.1. Sums and Products, Moduli, Polar form, Geometrical representation of Complex Numbers, Exponential form, arguments of Products and Quotients.
1.2. De-Moivre's Theorem and examples
1.3 Applications of De-Moivre's Theorem
1.3.1 n^{th} roots of unity.
1.3.2 Expansion of $\cos n\theta$, $\sin n\theta$
1.3.3 Circular functions and hyperbolic functions.
1.3.4 Relations between circular and hyperbolic functions.
1.3.5 Inverse circular and hyperbolic functions.

UNIT – 2: MATRICES (15 hrs.)

2.1. Introduction
2.2 Definitions of Hermitian and Skew Hermitian matrices.
2.3. Properties of Hermitian and Skew Hermitian matrices.
2.4. Rank of a Matrix, Row-echelon form and reduced row echelon form, normal form.
2.5. System of linear homogeneous and non-homogeneous equations.
2.5.1. Condition for consistency.
2.5.2. Nature of the general solution.
2.5.3. Gaussian elimination and Gauss Jordon method
(Using row-echelon form and reduced row echelon form).
2.5.4. Examples based on 2.4.1, 2.4.2 and 2.4.3.
2.6. Characteristic equation, eigen values and eigen vectors of a matrix and examples
2.7. Cayley Hamilton theorem and examples.

Recommended Books:

1. **Applied Mathematics** by Ch.V. Ramana Murthy, N. C. Shrinivas, S. Chand and Company Ltd., 1st Edition, 2001.
   Scope: Unit-I: Chapter No. 1: Art.1.2 to Art.1.13, Art. 1.15, Art. 1.17 to Art. 1.19, Art.1.23
2. **Higher Engineering Mathematics** by H. K. Dass, Er. Rajnish Verma, S. Chand and Company Pvt. Ltd. 3rd Revised Edition 2014.
   Scope: Unit-II: Art. 19.1 to Art. 19.3, Art. 21.1 to Art. 21.6, Art. 21.27 to Art. 21.30, Art. 20.1 to Art. 20.4

Reference Books:

1. **Elementary Linear Algebra (**Application Version**)**, Howard Anton and Chris Rorres, 10th Edition, 2010.
2. **Complex Variables and Applications,** James Ward Brown and Ruel V. Churchill, Mc-Graw Hill, 8th Edition, 2009.
3. **Modern Algebra**, A. R. Vasishtha, Krishna Prakashan, Meerut 1994.
4. **A Text Book of Matrices** - Shanti Narayan (Revised by P. K. Mittal), S. Chand and Co., 11th Edition, reprint 2007.

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – I)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type	**:**	**DSC – II**
Title of course	**:**	**Calculus**
Credit	**:**	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. find higher derivatives of product two differentiable functions using Leibnitz theorem.
CO 2. learn conceptual variations while advancing from one variable to several variables in calculus.
CO 3. understand the consequences of mean value theorems for differentiable functions.
CO 4. apply L' Hôpital's rule to various indeterminate forms.

Unit – 1: Differentiation **(15 hrs.)**

1.1. Successive Differentiation
- 1.1.1. Higher order derivatives: notations.
- 1.1.2. Calculation of n^{th} derivative: Standard results
- 1.1.3. Determination of n^{th} derivative of rational functions: Examples.
- 1.1.4. The n^{th} derivative of product of the powers of sine and cosines: Examples.
- 1.1.5. Leibnitz's Theorem. The n^{th} derivative of product of two functions.
- 1.1.6. Examples on Leibnitz's Theorem.

1.2. Partial differentiation
- 1.2.1. Introduction to functions of two and more variables
- 1.2.2. Partial derivative: first order and higher order – examples.
- 1.2.3. Geometrical interpretation of partial derivatives of first order.

Unit – 2: Mean Value Theorems and Indeterminate forms **(15 hrs.)**

2.1. Mean Value Theorems
- 2.1.1. Rolle's Mean Value Theorem, Geometrical interpretation.
- 2.1.2. Lagrange's Mean Value Theorem, Geometrical interpretation.
- 2.1.3. Meaning of sign of derivative
- 2.1.4. Cauchy's Mean Value Theorem.
- 2.1.5. Examples on 2.1.1, 2.1.2, 2.1.3 and 2.1.4

2.2. Indeterminate forms
- 2.2.1. Indeterminate forms: L' Hôpital's rule for $\frac{0}{0}$ and $\frac{\infty}{\infty}$ form (Statement only).
- 2.2.2. The indeterminate forms $0 \times \infty$, $\infty - \infty$, 0^0 , 1^∞ , ∞^0

2.3. Expansion of functions
- 2.3.1. Maclaurin's theorem (statement only): Examples.
- 2.3.2. Taylor's theorem (statement only): Examples.

Recommended Books:

1. **Differential Calculus,** Shanti Narayan and P.K. Mittal, S. Chand publishing, 15th edition (2016).

Scope:

Unit 1 – 1.1: Chapter 5: 5.1 to 5.5

1.2: Chapter 11: 11.6, 11.6.1, 11.7.1

Unit 2 – 2.1: Chapter 8: 8.1, 8.2, 8.3, 8.5

2.2: Chapter 10: 10.1 to 10.6

2.3: Chapter 6: 6.1, 6.2

Reference Books:

1. **Differential Calculus**, Gorakh Prasad, Pothishala Pvt. Ltd., 19th edition (2016).
2. **Aspects of Calculus**, Gabriel Klambauer, Springer-Verlag (1986).
3. **Differential Calculus**, Hari Kishan, Atlantic Publishers & Dist. (2007).
4. **Calculus**, George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir, Pearson Education, 14th edition (2018).

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – I)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type : DSC Practical – I
Title of course : Mathematics Practical – I
Credit : 02

Pr. No	Title of the Practical	No. of Practicals
1.	Examples on De-Moivre's Theorem	1
2.	n^{th} roots of unity	1
3.	Expansion of cos nθ, sin nθ	1
4.	Solution of system of linear homogeneous equations.	1
5.	Solution of system of linear non-homogeneous equations.	1
6.	Eigen values and Eigen vectors of matrix	1
7.	Cayley Hamilton Theorem (Verification and finding inverse of matrix)	1
8.	Examples of n^{th} derivative	1
9.	Examples on Leibnitz's Theorem.	1
10.	Examples on partial differentiation	1
11.	Lagrange's Mean Value Theorems.	1
12.	Cauchy's Mean Value Theorems.	1
13.	L' Hospital's rule for $0 \times \infty$ and $\infty - \infty$ form.	1
14.	L' Hospital's rule for 0^0 , 1^∞ , ∞^0 form.	1
15.	Examples on expansion of functions	1

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – I)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type	**:**	**Open Elective(OE – I)**
Title of course	**:**	**Quantitative Aptitude for Competitive Examinations**
Credit	**:**	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. demonstrate proficiency in fundamental arithmetic concepts.
CO 2. apply these concepts to solve everyday problems and demonstrate a practical understanding.
CO 3. gain practical skills in Practical Math Competence.
CO 4. solve real-world problems involving time, distance, and logical reasoning, acquire practical application abilities.

Unit 1: Essential Concepts in Arithmetic and Real-world Applications (15 Hr.)

1.1. HCF and LCM
1.2. Permutation and combination
1.3. Probability
1.4. Ratio and Proportion
1.5. Percentage and Average
1.6. Determination of Age
1.7. Profit and Loss
1.8. Progression and sequence

Unit 2: Temporal Toolbox: Navigating Time, Work, and Distances (15 Hrs.)

2.1. Time and Work
2.2. Work and Wages
2.3. Problems on Trains
2.4. Boats and streams
2.5. Problems on clock and Calendar
2.6. Time and distances
2.7. Heights and distances
2.8. Mathematical Operations and Arithmetical reasoning

Reference books:

1. Praveen, R.V. (2013). Quantitative Aptitude and Reasoning. 2nd Revised Edition, Prentice-Hall of India Pvt. Ltd.
2. Aggarwal, R. S. (2016). Quantitative Aptitude (Fully solved). S. Chand.
3. Ranganath, G. K., Sampangiram, C. S. and Rajaram, Y. (2008), A text Book of Business Mathematics. Himalaya Publishing House.
4. Guha, A. (2016), Quantitative Aptitude for Competitive Examination. Tata McGraw hill Publications.

Semester II

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – II)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type	**:**	**DSC – III**
Title of course	**:**	**Differential Equations - I**
Credit	**:**	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. classify differential equations.
CO 2. solve different types of differential equations.
CO 3. find orthogonal trajectories.
CO 4. apply the knowledge of differential equations to tackle problems occurring in physics and engineering.

Unit 1. Ordinary differential equations of first order and first degree (15 hrs.)

1.1 Introduction.
1.2 Exact differential equations.
  1.2.1 Necessary and sufficient condition for exactness.
  1.2.2 Differential equations reducible to exact, integrating factors with rules.
1.3 Linear differential equations.
1.4 Differential equations reducible to linear.
1.5 Applications of differential equations of first order and first degree:
  1.5.1 Law of growth.
  1.5.2 Law of decay.
  1.5.3 Newton's law of cooling.
  1.5.4 Orthogonal trajectories to Cartesian and Polar curves.
1.6 Examples based on 1.1 to 1.5.

Unit 2. Linear differential equations with constant coefficients (15 hrs.)

2.1 Introduction.
2.2 Auxiliary equation, Complementary function.
2.3 Types of complementary functions:
  2.3.1 Distinct real roots, repeated real roots, complex roots, repeated complex roots,
2.4 Particular integrals:
  2.4.1 Particular integrals of the functions: e^{ax}, sinax, cosax, x^m, $e^{ax}.V$ and $x.V$.

2.5 Applications to Electrical circuits.
2.6 Examples based on 2.1 to 2.5.

Recommended Book:

1. M. D. Raisinghania, Ordinary and Partial Differential Equations, 20th Revised Edition 2022; S.Chand and Company Pvt.Ltd.NewDelhi.
   Scope: Part 1 : Unit 2: 2.12 to 2.32, Unit 3: 3.1 to 3.8, Unit 5 : 5.1 to 5.25.

Reference Books:

1. Dr. A. B. Mathur and V. P. Jaggi, Advanced Engineering Mathematics, Khanna Publishers, 2nd edition, 2001.
2. R. K. Ghosh and K. C. Maity, An Introduction to Differential Equations, Book and Allied (P) Ltd., Seventh Edition, 2000.
3. D. A. Murray, Introductory Course in Differential Equations, Khosala Publishing House, Delhi.
4. Zafar Ahasan, Differential Equations and Their Applications, Second Edition, PHI2004.

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – II)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type	**:**	**DSC – IV**
Title of course	**:**	**Discrete Mathematics**
Credit	**:**	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. analyze the logical structure of statements symbolically, including the proper use of logical connectives, predicates, and quantifiers.
CO 2. construct truth tables, prove or disprove a hypothesis, and evaluate the truth of a statement using the principles of logic.
CO 3. understand and apply the fundamental concepts in graph theory.
CO 4. acquire the basic knowledge of graphs namely vertex, edge, special types of graph, isomorphic graphs, matrix representation of graphs.

Unit- 1 Propositional Calculus **(15 hrs.)**

1.1 **Revision**
- 1.1.1 Propositional Logic.
- 1.1.2 Propositional equivalence.

1.2 **Predicates and Quantifiers:**
- 1.2.1 Pedicate, n-place Pedicate, n-ary Pedicate.
- 1.2.2 Quantification and Quantifiers, Universal Quantifier, Existential Quantifier, Quantifiers with restricted domains.
- 1.2.3 Logical Equivalence involving Quantifiers.

1.3 **Rules of Inference:**
- 1.3.1 Argument in propositional Logic.
- 1.3.2 Validity Argument (Direct and Indirect methods)
- 1.3.3 Rules of Inference for Propositional Logic.
- 1.3.4 Building Arguments

1.4 Numerical Problems based on 1.2 to 1.3

Unit- 2 Graph Theory **(15 hrs.)**

2.1 **Graphs:**
- 2.1.1 Basic Terminology
- 2.1.2 Special types of Graphs (Complete graph, Regular graph, Bipartite and complete Bipartite graph)
- 2.1.3 Isomorphism
- 2.1.4 Adjacency and Incidence Matrix of Graph
- 2.1.5 Problems based on 2.1.2 to 2.1.4

2.2 **Operations on Graph:**
- 2.2.1 Subgraphs, vertex deletion, Edge addition.
- 2.2.2 Complement of a graph and self-complementary graphs.
- 2.2.3 Union, Intersection and Product of graphs.
- 2.2.4 Problems based on 2.1.1 to 2.1.3

Recommended Book:

1. Discrete Mathematics, S. R. Patil , M. D. Bhagat , R. S. Bhamare, S. M. Waingade, N. M. Phatangare and K. D. Masalkar, Nirali Prakashan, Pune.

Reference Books:

1. Discrete Mathematics, D. S. Malik and M. K. Sen, Cengage Learning India Pvt. Ltd, New Delhi.
2. Discrete Mathematical Structures (sixth edition), Kolman, Busby, Ross, Pearson Education (Prentice Hall).
3. Introduction to Graph Theory, Mamta Chaudhary, Vani Sharma and Pooja Yadav, Sultan Chand & Sons, Educational Publishers, New Delhi.
4. Schums Outline of Discrete Mathematics, Seymour Lipschutz, Marc Lipson, Revised Third Edition-McGraw-Hill (2009).

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – II)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type : DSC Practical – II
Title of course : Mathematics Practical – II
Credit : 02

Pr. No	Title of the Practical	No. of Practicals
1.	Differential equations reducible to exact	1
2.	Linear differential equations	1
3.	Bernoulli's Differential equations	1
4.	Law of growth	1
5.	Law of decay	1
6.	Newton's law of cooling	1
7.	Orthogonal Trajectories to Cartesian Curves	1
8.	Orthogonal Trajectories to Polar Curves	1
9.	Linear differential equations with constant coefficients (examples on finding C. F.)	1
10.	Particular integrals of the functions: e^{ax}, sin ax, cos ax	1
11.	Particular integrals of the functions: x^m, $e^{ax}.V$ and $x.V$	1
12.	Test the validity of the argument using truth table.	1
13.	Show the implications without using truth table.	1
14.	Draw the graph represented by the given adjacency matrix.	1
15.	Find the incidence matrix of the given graphs.	1

B. Sc. (Mathematics) (Part I) (Level 4.5)(Semester – II)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type : Open Elective(OE – II)
Title of course : Practicals on Quantitative Aptitude
Credit : 02

Pr. No.	Title of the Practical	No. of Practical's
1.	Problems on HCF and LCM	1
2.	Problems on Permutation and combination	1
3.	Problems on Ratio and Proportion	1
4.	Problems on Percentage and Average	1
5.	Problems on Determination of Age	1
6.	Problems on Profit and Loss	1
7.	Problems on Progression and sequence	1
8.	Problems on Time and Work	1
9.	Problems on Work and Wages	1
10.	Problems on Trains	1
11.	Problems on Boats and streams	1
12.	Problems on clock and Calendar	1
13.	Problems on Time and distances	1
14.	Problems on Heights and distances	1
15.	Problems on Mathematical Operations	1

Reference books:

1. Praveen, R.V. (2013). Quantitative Aptitude and Reasoning. 2nd Revised Edition, Prentice-Hall of India Pvt. Ltd.
2. Aggarwal, R. S. (2016). Quantitative Aptitude (Fully solved). S. Chand.
3. Ranganath, G. K., Sampangiram, C. S. and Rajaram, Y. (2008), A text Book of Business Mathematics. Himalaya Publishing House.
4. Guha, A. (2016), Quantitative Aptitude for Competitive Examination. Tata McGraw hill Publications.

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NATURE OF QUESTION PAPER:

A. **Continuous Assessment (CA):**
Term work shall be of 10 marks for the courses of 2 credits.

B. **End Semester Assessment:**

1. End Semester examination shall be of 40 marks for the courses of 2 credits.
2. The nature of Question Paper for Theory Examination:
   Maximum Marks: 40 Duration: 2 hrs.
   Q. 1) Choose the correct alternative from the following and rewrite the sentence. [8]
   a) to h) MCQ one mark each with four options
   i) ii) iii) iv)
   Q. 2) Attempt any TWO of the following [16]
   a)
   b)
   c)
   Q. 3) Attempt any FOUR of the following [16]
   a)
   b)
   c)
   d)
   e)
   f)

C. Practical Examination:

1. Practical examination shall be of 50 marks for the courses of 2 credits.
2. Distribution of marks: Practical question paper – 40 marks, Certified Journals – 05 marks, Viva – voce – 05 marks.
3. The nature of Question Paper for Practical Examination:
   Q.1 (A) (10 Marks)
   (B) (05 Marks)

   OR

   Q.1 (A) (10 Marks)
   (B) (05 Marks)

   Q.2 (A) (10 Marks)
   (B) (05 Marks)

   OR

   Q.2 (A) (10 Marks)
   (B) (05 Marks)

   Q.3 Attempt any TWO of the following
   (A) (05 Marks)
   (B) (05 Marks)
   (C) (05 Marks)
   (D) (05 Marks)

Equivalence of Courses

B. Sc. Part I (Semester I and II)

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Credit**	**Course Code**	**Title of New Course**	**Credit**
I	DSC – A5	Calculus	2	DSC – II	Calculus	2
I	DSC – A6	Differential Equations	2	DSC – III	Differential Equations – I	2
II	DSC – B5	Multivariable Calculus	2	DSC – VII	Differential Calculus	2
II	DSC – B6	Basic Algebra	2	DSC – I	Basic Algebra	2
I and II	CCPM-I	Core Course Practical in Mathematics - I	4	DSC Practical – I and DSC Practical – II	Mathematics Practical – I and Mathematics Practical - II	2 + 2

B. Sc. Part II (Semester III and IV)

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Cr.**	**Course Code**	**Title of New Course**	**Cr.**
III	DSC – C5	Elements of Differential Equations	2	DSC – V	Differential Equations – II	2
III	DSC – C6	Numerical Methods	2	DSC – VI	Numerical Methods	2
IV	DSC – D5	Vector Calculus	2	DSE – I	Vector Calculus	2
IV	DSC – D6	Integral Calculus	2	DSC – VIII	Integral Calculus	2
III and IV	CCPM-II	Differential equations, Numerical methods, Vector and Integral Calculus	4	DSC Practical – III	Mathematics Practical – III (Sem – III)	4
III and IV	CCPM-III	Numerical Recipes in Scilab	4	DSC Practical – IV	Mathematics Practical – IV (Sem – IV)	4

B. Sc. Part III (Semester V and VI)

Old Course				Equivalent Course		
Sem No.	**Course Code**	**Title of Old Course**	**Cr.**	**Course Code**	**Title of New Course**	**Cr.**
V	DSE – E09	Mathematical Analysis	2	DSC – IX	Real Analysis	2
	DSE – E10	Abstract Algebra	2	DSC – X	Modern Algebra	2
	DSE – E11	Optimization Techniques	2	DSC – XVI	Operations Research	2
	DSE – E12	Integral Transforms	2	DSC – XII	Integral Transform	2
VI	DSE – F09	Metric Spaces	2	DSC – XIII	Metric Spaces	2
	DSE – F10	Linear Algebra	2	DSC – XIV	Linear Algebra	2
	DSE – F11	Complex Analysis	2	DSC – XV	Complex Analysis	2
	DSE – F12	Discrete Mathematics	2	DSC – IV	Discrete Mathematics	2
	CCPM-IV	Operations Research	4	DSC Practical – V	Mathematics Practical – III (Sem – V)	8
	CCPM-V	Laplace and Fourier Transforms	4			
	CCPM-VI	Python Programming	4	DSC Practical – VI	Mathematics Practical – IV (Sem – VI)	8
	CCPM-VII	Project, sturdy tour, viva.	4			

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – I)
(NEP-2020)

Syllabus to be implemented from Academic Year 2024-25

Course type	**:**	**Open Elective(OE – I)**
Title of course	**:**	**Quantitative Aptitude for Competitive Examinations**
Credit	**:**	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. demonstrate proficiency in fundamental arithmetic concepts.
CO 2. apply these concepts to solve everyday problems and demonstrate a practical understanding.
CO 3. gain practical skills in Practical Math Competence.
CO 4. solve real-world problems involving time, distance, and logical reasoning, acquire practical application abilities.

Unit 1: Essential Concepts in Arithmetic and Real-world Applications (15 Hr.)

1.1. HCF and LCM
1.2. Permutation and combination
1.3. Probability
1.4. Ratio and Proportion
1.5. Percentage and Average
1.6. Determination of Age
1.7. Profit and Loss
1.8. Progression and sequence

Unit 2: Temporal Toolbox: Navigating Time, Work, and Distances (15 Hrs.)

2.1. Time and Work
2.2. Work and Wages
2.3. Problems on Trains
2.4. Boats and streams
2.5. Problems on clock and Calendar
2.6. Time and distances
2.7. Heights and distances
2.8. Mathematical Operations and Arithmetical reasoning

Reference books:

1. Praveen, R.V. (2013). Quantitative Aptitude and Reasoning. 2nd Revised Edition, Prentice- Hall of India Pvt. Ltd.
2. Aggarwal, R. S. (2016). Quantitative Aptitude (Fully solved). S. Chand.
3. Ranganath, G. K., Sampangiram, C. S. and Rajaram, Y. (2008), A text Book of Business Mathematics. Himalaya Publishing House.
4. Guha, A. (2016), Quantitative Aptitude for Competitive Examination. Tata McGraw hill Publications.

B. Sc. (Mathematics) (Part I) (Level 4.5)(Semester – II)
(NEP-2020)

Syllabus to be implemented from Academic Year 2024-25

Course type : Open Elective(OE – II)
Title of course : Practicals on Quantitative Aptitude
Credit : 02

Pr. No.	Title of the Practical	No. of Practical's
1.	Problems on HCF and LCM	1
2.	Problems on Permutation and combination	1
3.	Problems on Ratio and Proportion	1
4.	Problems on Percentage and Average	1
5.	Problems on Determination of Age	1
6.	Problems on Profit and Loss	1
7.	Problems on Progression and sequence	1
8.	Problems on Time and Work	1
9.	Problems on Work and Wages	1
10.	Problems on Trains	1
11.	Problems on Boats and streams	1
12.	Problems on clock and Calendar	1
13.	Problems on Time and distances	1
14.	Problems on Heights and distances	1
15.	Problems on Mathematical Operations	1

Reference books:

1. Praveen, R.V. (2013). Quantitative Aptitude and Reasoning. 2nd Revised Edition, Prentice- Hall of India Pvt. Ltd.
2. Aggarwal, R. S. (2016). Quantitative Aptitude (Fully solved). S. Chand.
3. Ranganath, G. K., Sampangiram, C. S. and Rajaram, Y. (2008), A text Book of Business Mathematics. Himalaya Publishing House.
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