

**Shyam Lal College, University of Delhi**  
**Tentative Teaching Plan**

**Academic Year: 2024-25**

**Teacher Name: Dr. Virender**

**Course Name: B.Sc./B.Sc.**

**Paper Name: Elementary Mathematical Analysis**

**Semester: Semester V (August 1, 2024 to November 28, 2024)**

**UPC:**

**Theory Classes**

<b>Week</b>	<b>Topic to be covered</b>	<b>Activity</b>	<b>Remarks (References/ Resources</b>
<b>Week 1 - 3</b>	Sequential criterion for limits and continuity of functions, Continuity on intervals, Intermediate value theorem and applications.	Discussion and illustration	Chapter 4 (Section 4.1 [Definition 4.1.1, Theorem 4.1.9, Corollary 4.1.10, 4.1.11, and Example 4.1.12]), Chapter 5 (Section 5.1 [Definition 5.1.1, Theorem 5.1.3, Corollary 5.1.4, Example 5.1.5, and 5.1.11]), Chapter 5 (Section 5.3 [page 249 to 252, Corollary 5.3.13])
<b>Week 4</b>	Uniform continuity.	Discussion and illustration	Chapter 5 (Section 5.4 [up to page 260, first proof that $f(x) = 1/x$ is <i>not</i> uniformly continuous on $(0,1)$ ])
<b>Week 5 &amp; 7</b>	Riemann integration, criterion for integrability and examples, Integrability of continuous and monotone functions.	Discussion and illustration	Chapter 7 (Section 7.2)
<b>Week 8 &amp; 9</b>	Algebraic properties of the Riemann integral, Fundamental theorem of calculus (first form).	Discussion and illustration	Chapter 7 (Section 7.5 [Theorem 7.5.1, 7.5.2, and Corollary 7.5.5], alternative independent proofs using Theorem 7.2.14 may be given from Section 33 of K. A. Ross, Elementary Analysis: Theory of Calculus, Springer), Chapter 7 (Section 7.6 [Definition 7.6.1, Theorem 7.6.2, and Remark 7.6.3])

<b>Week 10 &amp; 11</b>	Sequences and series of functions: Pointwise and uniform convergence, Uniform Cauchy criterion.	Discussion and illustration	Chapter 9 (pages 544 to 551, all theorems without proofs)
<b>Week 12 &amp; 13</b>	Weierstrass M-test, Implications of uniform convergence in calculus.	Discussion and illustration	Chapter 9 (Theorem 9.2.11 to Corollary 9.2.14, page 553]), Chapter 9 (Section 9.3 [pages 557 to 562, all theorems without proofs]).
<b>Week 14 &amp; 15</b>	Power series, Radius and interval of convergence, Applications of Abel's theorem for power series.	Discussion and illustration	Chapter 8 (Section 8.6, all theorems without proofs)

### Reference Book:

1. Denlinger, Charles G. (2011). Elements of Real Analysis. Jones & Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.

### Additional Readings:

1. Bartle, Robert G., & Sherbert, Donald R. (2011). Introduction to Real Analysis (4<sup>th</sup> ed.). John Wiley & Sons. Wiley India Edition 2015.
2. Ross, Kenneth A. (2013). Elementary Analysis: The Theory of Calculus (2<sup>nd</sup> ed.). Undergraduate Texts in Mathematics, Springer. Indian Reprint.

**Assessment Activity Schedule:** The assessment will be conducted during the course, preferably after completion of each unit. Week 1 – 4, Week 5 – 9 and Week 10 – 15 contain three units of the syllabus. Besides tests/assignments, students are encouraged to give blackboard presentation or power point presentation on the topic of their choices covering the content of the syllabi and applications of the theory.

### Signature of the Teacher

**Name of the Teacher: Dr. Virender**

**Designation: Assistant Professor in Mathematics**

**Shyam Lal College, University of Delhi**  
**Tentative Teaching Plan**

**Academic Year: 2024-25**

**Teacher Name: Dr. Virender**

**Course Name: B.A./B.Sc./B.Com.**

**Paper Name: Financial Modeling with Excel**

**Semester: Semester I/III/V (August 1, 2024 to November 28, 2024)**

**UPC:**

**Practical Classes**

<b>Week</b>	<b>Topic to be covered</b>	<b>Activity</b>	<b>Remarks (References/ Resources</b>
<b>Week 1</b>	Excel Skills, Building good financial models.	Discussion and illustration	Review of Excel basics and functions from Chapters 21 to 23, and Chapter 1 (Section 1.4)
<b>Week 2</b>	Interest rates, Future value.	Discussion and illustration	Chapter 2 (Section 2.1)
<b>Week 3 &amp; 4</b>	Present value, Annuity, Perpetuity, Present value of an annuity, Present value of a perpetuity, Present value of non-annuity cash flows.	Discussion and illustration	Chapter 2 (Section 2.2)
<b>Week 5</b>	Net present value (NPV), Internal rate of return (IRR), NPV vs IRR.	Discussion and illustration	Chapter 3 (3.1 to 3.3)
<b>Week 6</b>	Loans and amortization tables, Interest-only loan, An equal amortization term loan, Mortgage.	Discussion and illustration	Chapter 4 (Sections 4.2 to 4.5)
<b>Week 7</b>	Effective interest rates, Cost of a mortgage, Continuous compounding and discounting.	Discussion and illustration	Chapter 5 (Sections 5.1, 5.2, and 5.7)
<b>Week 8 &amp; 10</b>	Characteristics of bonds, Zero-coupon bond, Bond valuation, Yield, Yield curve and forward rates; Macaulay duration, Modified duration, and convexity.	Discussion and illustration	Chapter 10

<b>Week 11 &amp; 13</b>	Call and put options, Option strategies, Put-call parity.	Discussion and illustration	Chapter 17, and Chapter 18 (Section 18.3, and Exercises 4 to 6, page 602)
<b>Week 14</b>	Black-Scholes formulae for prices of call and put options.	Discussion and illustration	Chapter 19 (Section 19.1)
<b>Week 15</b>	Binomial option pricing model, Two-period binomial model.	Discussion and illustration	Chapter 20 (20.1 to 20.3)

**Reference Book:**

1. Benninga, Simon & Mofkadi, Tal (2018). Principles of Finance with Excel (3rd ed.). Oxford University Press, New York.
2. Sengupta, Chandan (2004). Financial Modeling using Excel and VBA. John Wiley.

**Suggested Readings:**

1. Day, Alastair L. (2015). Mastering Financial Mathematics in Microsoft Excel (3<sup>rd</sup> ed.). Pearson Education Ltd.
2. Luenberger, David G. (2014). Investment Science (2nd ed.). Oxford University Press.

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**Signature of the Teacher**

**Name of the Teacher: Dr. Virender**

**Designation: Assistant Professor in Mathematics**

**Shyam Lal College, University of Delhi**  
**Tentative Teaching Plan**

**Academic Year: 2024-25**

**Teacher Name: Dr. Virender**

**Course Name: B.Sc. (H) Mathematics**

**Paper Name: Group Theory**

**Semester: Semester III (August 1, 2024 to November 28, 2024)**

**UPC: 2352012301**

**Theory Classes**

<b>Week</b>	<b>Topic to be covered</b>	<b>Activity</b>	<b>Remarks (References/ Resources)</b>
<b>Week 1 &amp; 2</b>	Permutation groups and group of symmetries, Cycle notation for permutations and properties, Even and odd permutations, Alternating groups.	Discussion and illustration	Chapter 5 (up to Theorem 5.7, page 104)
<b>Week 3 &amp; 4</b>	Cosets and its properties, Lagrange's theorem and consequences including Fermat's Little theorem, Number of elements in product of two finite subgroups.	Discussion and illustration	Chapter 7 (up to Example 6, page 144)
<b>Week 5 &amp; 6</b>	Normal subgroups, Factor groups, Cauchy's theorem for finite Abelian groups.	Discussion and illustration	Chapter 9 (Theorems 9.1, 9.2, 9.3 and 9.5, and Examples 1 to 12)
<b>Week 7 &amp; 8</b>	Group homomorphisms, isomorphisms and properties, Cayley's theorem.	Discussion and illustration	Chapter 10 (Theorems 10.1 and 10.2, Examples 1 to 11) Chapter 6 (Theorems 6.1, 6.2, 6.3, and Examples 1 to 10)
<b>Week 9</b>	First, Second and Third isomorphism theorems for groups.	Discussion and illustration	Chapter 10 (Theorems 10.3, 10.4, Examples 12 to 15, and Exercises 41 and 42, page 208 for second and third isomorphism theorems for groups)
<b>Week 10 &amp; 11</b>	Automorphism, Inner automorphism, Automorphism groups, Automorphism groups of cyclic groups, Applications	Discussion and illustration	Chapter 6 (Page 128 to 132)

	of factor groups to automorphism groups.		Chapter 9 (Theorem 9.4, and Example 16)
<b>Week 12 &amp; 13</b>	External direct products of groups and its properties, The group of units modulo $n$ as an external direct product, Applications to data security and electric circuits.	Discussion and illustration	Chapter 8
<b>Week 14 &amp; 15</b>	Internal direct products; Fundamental theorem of finite Abelian groups and its isomorphism classes.	Discussion and illustration	Chapter 9 (Section on internal direct products, pages 183 to 187) Chapter 11 (Outline of the proof of Fundamental theorem of finite Abelian groups, and its application to determine the isomorphism classes of Abelian groups)

**Reference Book:**

1. Gallian, Joseph. A. (2017). Contemporary Abstract Algebra (9th ed.). Cengage Learning India Private Limited, Delhi. Indian Reprint 2021.

**Suggestive Readings:**

1. Artin, Michael. (1991). Algebra (2nd ed.). Pearson Education. Indian Reprint 2015.
2. Dummit, David S., & Foote, Richard M. (2016). Abstract Algebra (3rd ed.). Student Edition. Wiley India.
3. Herstein, I. N. (1975). Topics in Algebra (2nd ed.). Wiley India, Reprint 2022.
4. Rotman, Joseph J. (1995). An Introduction to The Theory of Groups (4th ed.). SpringerVerlag, New York.

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**Signature of the Teacher**

**Name of the Teacher: Dr. Virender**

**Designation: Assistant Professor in Mathematics**