

**Shri Krishan Chander GDC Poonch
(Autonomous)**

B.A/B.Sc. Honours (FYUGP)

In

Mathematics

(ARTS/ SCIENCE)

SYLLABUS

Four Year Undergraduate Programme

As Per NEP 2020 Guidelines

FOR THE STUDENTS TO BE ADMITTED IN THE SESSIONS

2026-27, 2027-28, 2028-29

Courses of Study**Semester-I**

S.No	Course Type	Course Code	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Exam	End Exam	Internal	External	
1	Major (Theory)	UMJMATH-101	Calculus-I	4	20	80	-	-	100
2	Major (Practical)	UMJMAT-111	LaTeX Fundamentals	2	-	-	25	25	50
3	Minor (Theory)	UMIMATH-121	Calculus of one Variable	4	20	80	-	-	100
4	Minor (Practical)	UMIMAPR-131	Fundamental Digital Tools	2	-	-	25	25	50
5	MD	UMDMATH-141	Logical and Analytical Ability	3	15	60	-	-	75
6	Skill	USEMAPR-151	Data Handling and Statistical Skills	3			35	40	75

Semester-II

S.No	Course Type	Course Code	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
					Mid Exam	End Exam	Internal	External	
1	Major (Theory)	UMJMATH-201	Calculus-II	4	20	80	-	-	100
2	Major (Practical)	UMJMAPR-211	Advanced LaTeX	2	-	-	25	25	50
3	Minor (Theory)	UMIMATH-221	Integral Calculus & Geometrical Applications	4	20	80	-	-	100
4	Minor (Practical)	UMIMAPR-231	Advanced Digital Tools	2	-	-	25	25	50
5	MD	UMDMAT-241	Logical and Analytical Ability	3	15	60	-	-	75
6	Skill	USEMAPR-251	Mathematical Analysis & Optimization	3			35	40	75

Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-I

For examinations to be held in Dec. 2026, 2027 & 2028

Course Code: UMJMATH-101

Course Title: Calculus-I

Credits: 04

Total Number of Lectures: 60

Maximum Marks: 100 (External:80 & Internal:20)

UNIT-I (15 Hours)

Limit & Continuity of real functions: ε - δ definition of limit of a function with elementary examples; Uniqueness of limit; Limit of sum, difference, product and quotient of two functions; Limits and inequalities; Limit of composition of two functions; Left and right handed limits; Limit at infinity; continuity - Algebra of continuous functions; Various types of discontinuities; Problems based on the above mentioned topics.

UNIT-II (15 Hours)

Differentiability and Indeterminate forms: Derivative of a function; Algebra of derivatives; bounded function - Existence of a max. / min. of a continuous function on a closed interval (Statement only); Derivatives at points of max. / min. of a function; Mean value theorems - Rolle's, Lagrange's & Cauchy - with elementary applications; Taylor's Theorem with Lagrange's form of remainder; Intermediate forms - L Hopital's rule; Problems based on the above mentioned topics.

UNIT-III (15 Hours)

Reduction Formulae: Review of the concept and techniques of Indefinite and Definite Integral; Reduction formulae for integral powers of the six trigonometric functions; Reduction formulae for "product of integral powers of Sine and Cosine", "product of integral powers of secant and cosecant & "product of integral powers of Tangent & Cotangent; Wallis's Formulae; Problems based on the above mentioned topics.

UNIT-IV (15 Hours)

Applications: Tangent and normal to a curve - slope and equation; Angle of intersection of two curves; Increasing & Decreasing functions; Concavity - Concave up & Concave downward curves; Area between the curves; Volume of the solid obtained by rotating a region about x- axis or y - axis; lengths of plane arcs; surface of revolution; Examples and exercises based on the above mentioned topics.

Text Book:

1. : Narayan, S. (2005), *Differential Calculus*; S. Chand Publishing, ISBN, 8121904714, 9788121904711.
2. Narayan, Shanti. *Integral Calculus*. S. Chand & Company Pvt. Ltd., New Delhi; Latest Edition.

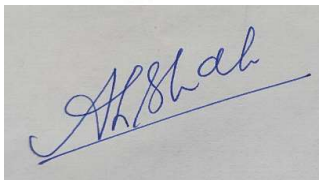
Reference Books:

1. Apostol, T. M. (1969). *Calculus, Volume 2: Multi-variable calculus and linear algebra, with applications to differential equations and probability* (2nd ed.). Wiley.
2. Malik, S. C., & Savita Arora. (2022). *Mathematical Analysis*. New Delhi: New Age International Publications.

Scheme of Examination:

- (i) After completion of half of the syllabus (i.e., two units), a **mid-term assessment test** of 15 marks shall be conducted with a duration of 60 minutes and 05 marks reserved for attendance. The question paper shall be set in such a way that each unit carries equal weightage of marks, with internal choice provided within each unit.
- (ii) The external examination of 80 marks shall be of 3 hours' duration. The question paper shall cover the entire syllabus, with each unit carrying equal weightage of 20 marks, and internal choice provided within each unit.



Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-I

For examinations to be held in Dec. 2026,2027 & 2028

Course Code: UMJMAPR-111

Course Title: LaTeX Fundamentals

Credits: 02

Total number of Lectures: 60

Maximum Marks: 50 (External: 25 & Internal:25)

UNIT-I (30 Hours)

Fundamentals of LaTeX and Mathematical Typesetting: Introduction to LaTeX and its applications in academic& Scientific writing; Overview and usage of Overleaf for collaborative document preparation; Basics of coding in LaTeX, including document structure, commands, and environments; Writing and formatting mathematical expressions using LaTeX; Conversion of mathematical expressions into properly formatted LaTeX code and generation of professionally typeset mathematical equations.

UNIT-II (30 Hours)

LaTeX Coding, File Management, and Debugging: Interpretation of mathematical equations into corresponding LaTeX code and vice versa. Creation, compilation, and management of LaTeX files and projects; Working with packages and document classes; Identification, handling, and debugging of common errors in LaTeX documents. Best practices for efficient document preparation and project organization.

Text Book:

1. Oetiker, T., Partl, H., Hyna, I., &Schlegl, E. (2021),*The Not So Short Introduction to LaTeX2ε*. Version 6.4.

Reference Books:

1. Diller, A. (1993). *LaTeX line by line*. Wiley.
2. Knuth, D. E. (1984). *The TeXbook*. Addison-Wesley.

Scheme of Examination:

The breakup of the internal assessment of 25 marks shall be as follows:

- (i) Written test - 10 marks;
- (ii) Attendance - 5 marks;
- (iii) Daily performance - 5 marks; and
- (iv) Viva voce - 5 marks.

For the external examination, a practical examination of 25 marks shall be conducted by the examiner.

Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-I

For examinations to be held in Dec. 2026, 2027 & 2028

Course Code: UMIMATH-121

Course Title: Calculus of one variable

Credits: 04

Total Number of Lectures: 60

Maximum Marks: 100 (External: 80 & Internal: 20)

UNIT-I (15 Hours)

Limit & Continuity of real functions: ε - δ definition of limit of a function with elementary examples; Uniqueness of limit; Limit of sum, difference, product and quotient of two functions; Limits and inequalities; Limit of composition of two functions; Left and right handed limits; Limit at infinity; continuity - Algebra of continuous functions; Various types of discontinuities; Problems based on the above mentioned topics.

UNIT-II (15 Hours)

Differentiability and Indeterminate forms: Derivative of a function; Algebra of derivatives; bounded function - Existence of a max. / min. of a continuous function on a closed interval (Statement only); Derivatives at points of max. / min. of a function; Mean value theorems - Rolle's, Lagrange's & Cauchy - with elementary applications; Taylor's Theorem with Lagrange's form of remainder; Intermediate forms - L Hopital's rule; Problems based on the above mentioned topics.

UNIT-III (15 Hours)

Reduction Formulae: Review of the concept and techniques of Indefinite and Definite Integral; Reduction formulae for integral powers of the six trigonometric functions; Reduction formulae for "product of integral powers of Sine and Cosine", "product of integral powers of secant and cosecant & "product of integral powers of Tangent & Cotangent; Wallis's Formulae; Problems based on the above mentioned topics.

UNIT-IV (15 Hours)

Applications: Tangent and normal to a curve - slope and equation; Angle of intersection of two curves; Increasing & Decreasing functions; Concavity - Concave up & Concave downward curves; Area between the curves; Volume of the solid obtained by rotating a region about x- axis or y - axis; lengths of plane arcs; surface of revolution; Examples and exercises based on the above mentioned topics.

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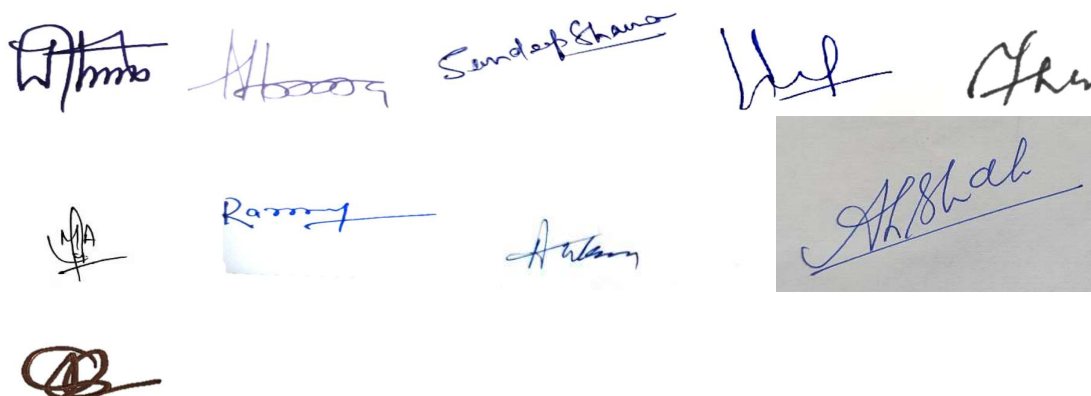
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2. Malik, S. C., & Savita Arora. (2022). *Mathematical Analysis*. New Delhi: New Age International Publications.

Scheme of Examination:

(i) After completion of half of the syllabus (i.e., two units), a **mid-term assessment test** of 15 marks shall be conducted with a duration of 60 minutes and 05 marks reserved for attendance. The question paper shall be set in such a way that each unit carries equal weightage of marks, with internal choice provided within each unit.

(ii) The external examination of 80 marks shall be of 3 hours' duration. The question paper shall cover the entire syllabus, with each unit carrying equal weightage of 20 marks, and internal choice provided within each unit.



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Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-I

For examinations to be held in Dec. 2026, 2027 & 2028

Course Code: UMIMAPR-131

Course Title: Fundamental Digital Tools

Credits: 02

Total number of Lectures: 60

Maximum Marks: 50 (External: 25 & Internal: 25)

UNIT-I (30 Hours)

Fundamentals of LaTeX and Mathematical Typesetting: Introduction to LaTeX and its applications in academics & Scientific writing; Overview and usage of Overleaf for collaborative document preparation; Basics of coding in LaTeX, including document structure, commands, and environments; Writing and formatting mathematical expressions using LaTeX; Conversion of mathematical expressions into properly formatted LaTeX code and generation of professionally typeset mathematical equations.

UNIT-II (30 Hours)

LaTeX Coding, File Management, and Debugging: Interpretation of mathematical equations into corresponding LaTeX code and vice versa. Creation, compilation, and management of LaTeX files and projects; Working with packages and document classes; Identification, handling, and debugging of common errors in LaTeX documents. Best practices for efficient document preparation and project organization.

Text Book:

1. Oetiker, T., Partl, H., Hyna, I., &Schlegl, E. (2021), *The Not So Short Introduction to LaTeX2ε*. Version 6.4.

Reference Books:

1. Diller, A. (1993). *LaTeX line by line*. Wiley.
2. Knuth, D. E. (1984). *The TeXbook*. Addison-Wesley.

Scheme of Examination:

The breakup of the internal assessment of 25 marks shall be as follows:

1. Written test - 10 marks;
2. Attendance - 5 marks;
3. Daily performance - 5 marks; and
4. Viva voce - 5 marks.

For the external examination, a practical examination of 25 marks shall be conducted by the examiner.

Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-I

For examinations to be held in Dec. 2026, 2027 & 2028

Course Code: UMDMATH-141

Course Title: Logical and Analytical Ability

Credits: 03

Total number of Lectures: 45

Maximum Marks: 75 (External: 60 & Internal:15)

UNIT-I (15 Hours)

Logical Reasoning and Analytical Ability: Identifying patterns, logical arguments, Coding-Decoding, Direction Sense, Seating Arrangement (Linear/Circular), Clocks, Calendars and analytical puzzles; **General Mental Ability:** Numerical reasoning, patterns, and problem-solving skills; **Data Interpretation:** Pie charts, Bar graphs, Tables, Data sufficiency, Trend analysis; Problems based on the above mentioned topics.

UNIT-II (15 Hours)

Cartesian Product and Logic: Propositions, truth values, truth tables, Conjunction, Disjunction, Implications, Negations. Tautology, Contradiction, Contrapositive, Quantifiers; Problems based on the above mentioned topics.

UNIT-III (15 Hours)

Fundamentals of Sets: The idea of a set; Operations on Sets - Union Intersection, Difference of sets; Complement of a set; Venn Diagram; De-Morgan law's Cardinality of a set; Cartesian product of two sets; Problems based on the above mentioned topics.

Text Books:

1. Sharma, A. (2020). *How to prepare for logical reasoning for CAT*. McGraw Hill.
2. Liu, C. L., & Mohapatra, D. P. (2017). *Elements of discrete mathematics*. McGraw-Hill.

Reference Books:

1. Kolman, B., Busby, R. C., & Ross, S. (2016). *Discrete mathematical structures* (6th ed.). Pearson.
2. K. H. Rosen, *Discrete Mathematics & its applications*, 5th Ed. 2004, Tata Mc Graw Hill.
3. Lipschitz, Seymour, *Discrete Mathematics*, 2nd Ed. Tata McGraw Hill, New Delhi.

Scheme of Examination:

- (i) After completion of half of the syllabus (i.e., two units), a **mid-term assessment test** of 15 marks shall be conducted with a duration of 60 minutes. The question paper shall be set in such a way that each unit carries equal weightage of marks.
- (ii) The external examination of 60 marks shall be of 2 hours' duration. The question paper shall cover the entire syllabus, with each unit carrying equal weightage of 20 marks, and internal choice provided within each unit.

  Sandeep Sharma  

 Ram  



Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-I

For examinations to be held in Dec. 2026, 2027 & 2028

Course Code: USEMAPR-151

Course Title: Data Handling and Statistical Skills

Credits: 3

Total Number of Lectures: 75

Maximum Marks: 75 (External: 40, Internal: 35)

UNIT-I (Theory - 15 Hours)

Fundamentals of Data Handling and Statistics: Data: Meaning and types of data; Primary and Secondary Data; Qualitative and Quantitative Data; Discrete and Continuous Data.

Organization of Data: Raw Data; Ungrouped Data; Grouped Data; Frequency Distribution; Class Interval; Class Limits; Class Boundaries; Class Mark (Mid-value); Cumulative Frequency.

Graphical Representation of Data: Need and importance of graphical representation of data; concept, construction, interpretation, advantages and limitations of **Bar Diagrams, Multiple Bar Diagrams, Pie Charts, Histograms, Frequency Polygons, and Line Graphs**

Measures of Central Tendency: Arithmetic Mean; Median; Mode (simple numerical problems only).

Unit-II (Practical - 60 Hours)

Students shall perform the following practical exercises using MS Excel/Google Sheets

Data entry, editing and formatting; Preparation of raw data tables; Classification of qualitative and quantitative data; Sorting and filtering of data; Preparation of grouped and ungrouped frequency distribution tables; Calculation of class intervals, Class boundaries, Class marks, relative frequencies, Percentages and cumulative frequencies; Calculation of Arithmetic Mean, Median and Mode using spreadsheet functions; Preparation, formatting and interpretation of Bar Diagrams, Multiple Bar Diagrams, Pie Charts, Histograms, Frequency Polygons and Line Graphs; selection of suitable graphical representation for a given dataset.

Students shall maintain a Practical Record File containing all practical exercises duly certified by the course teacher.

Scheme of Examination

For the Internal Examination, 35 marks shall be conducted from the 50% of the syllabus.

The breakup of the Internal Examination (35 Marks) shall be as follows:

(i) Internal Assessment - 15 Marks

(ii) Internal Practical - 20 Marks

For the External Examination, 45 Marks shall be conducted from the entire syllabus.

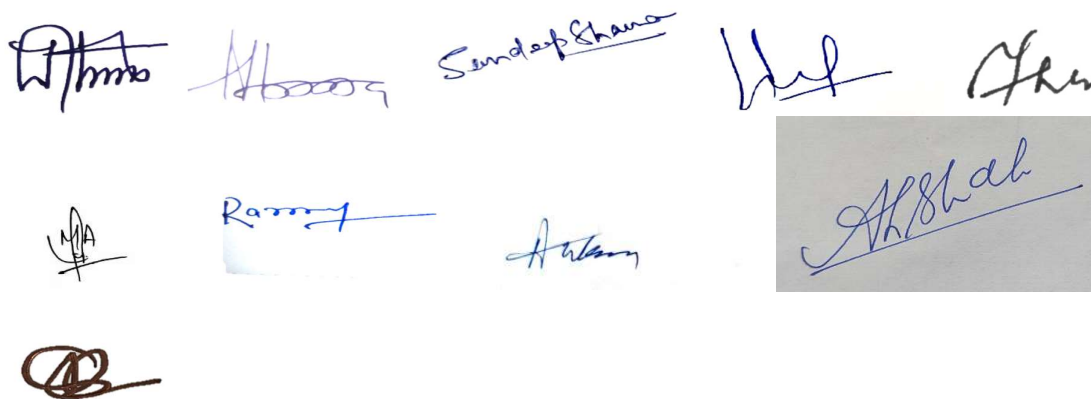
The breakup of the External Examination (45 Marks) shall be as follows:

(i) Internal Assessment - 20 Marks

(ii) External Practical - 25 Marks

Prescribed Books

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Applied Statistics.
2. D. N. Elhance, Fundamentals of Statistics.
3. Richard I. Levin and David S. Rubin, Statistics for Management.
4. Microsoft Excel / Google Sheets User Guide.
5. NCERT Mathematics (Statistics Chapters).



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Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-II

For examinations to be held in May 2027, 2028 & 2029

Course Code: UMJMATH-201

Course Title: Calculus-II

Course Credits: 04

Total Number of Lectures:60

Maximum Marks:100 (External:80 & Internal: 20)

UNIT-I (15 Hours)

Polar coordinates: The concept of Cartesian & Polar coordinates and relation between them; Angle between the radius vector and the tangent; angle of intersection of curves; Length of the perpendicular from the pole to the tangent; polar sub - tangent and polar sub - normal; Pedal equations; Polar curves - Cardioids, Lemniscates of Bernoulli, Spiral of Archimedes, Hyperbolic spiral, Equiangular spiral, Three / four leaved rose; Length of an arc in polar form; Problems based on the above mentioned topics.

UNIT-II (15 Hours)

Partial Derivatives: The concept of Limit, continuity and partial derivative of a real valued function of 2 and 3 variables; Homogeneous Functions- Euler's Theorem, Total differential; Differentiation of composite functions and implicit functions; Problems based on the above mentioned topics.

UNIT-III (15 Hours)

Applications of Partial Derivatives: Directional derivative & Gradient of a function of 2 and three variables; Tangent Planes and Linear Approximations; Taylor's theorem for a function of two variables (Statement only); Local Maximum / Minimum Values of a function of two variables - second derivative test; Double points - Node, cusp and conjugate; Problems based on the above mentioned topics.

UNIT-IV (15 Hours)

Asymptotes, Curve Tracing & Envelope: Vertical, Horizontal and Oblique asymptotes; Curve tracing of Cartesian equations of the form $y^2 = f(x)$ & $y^2 + yf(x) + g(x) = 0$; Envelope - Envelope of a one / two parameter family of curves; Problems based on the above mentioned topics.

Text Books:

01: Narayan, S. *Differential Calculus*; S. Chand Publishing, Latest Edition.

02: Narayan, Shanti. *Integral Calculus*. S. Chand & Company Pvt. Ltd., New Delhi; Latest Edition.

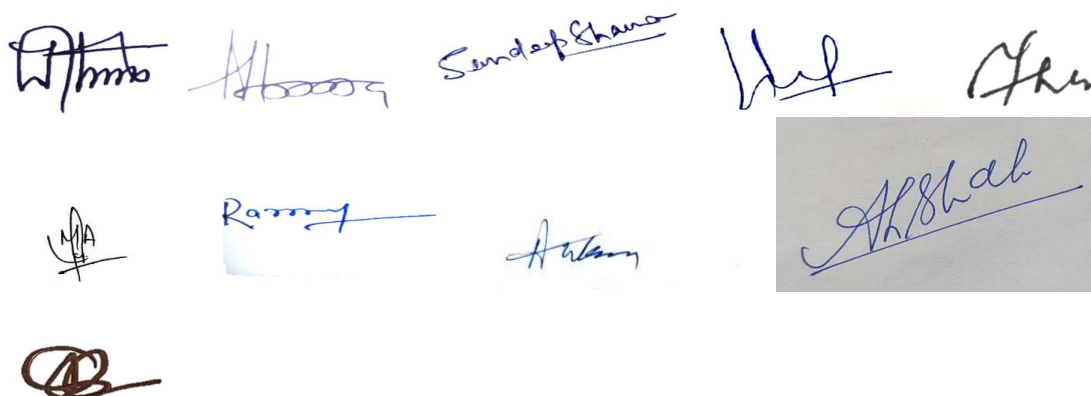
Reference Books:

1. Grewal, B. S. (2019). *Higher Engineering Mathematics* (44th ed.). New Delhi: Khanna Publishers.
2. Loney, S. L. (2016). *The Elements of Coordinate Geometry*. New Delhi: Arihant Publications.
3. Prasad, G. (2019). *A Textbook of Differential Calculus*. Meerut: Pothishala Pvt. Ltd.
4. Kreyszig, E. (2011). *Advanced Engineering Mathematics* (10th ed.). Hoboken, NJ: John Wiley & Sons.
5. Thomas, G. B., Weir, M. D., & Hass, J. (2018). *Thomas' Calculus* (14th ed.). Boston, MA: Pearson Education.
6. Fitzpatrick, P. M. (2006). *Advanced Calculus* (2nd ed.). Belmont, CA: Thomson Brooks/Cole.
7. Wrede, R. C., & Spiegel, M. R. (2010). *Advanced Calculus* (3rd ed.). New York: McGraw-Hill Education.
8. Ayres, F., & Mendelson, E. (2013). *Schaum's Outline of Calculus* (6th ed.). New York: McGraw-Hill Education.

Scheme of Examination:

(i) After completion of half of the syllabus (i.e., two units), a **mid-term assessment test** of 15 marks shall be conducted with a duration of 60 minutes and 05 marks reserved for attendance. The question paper shall be set in such a way that each unit carries equal weightage of marks, with internal choice provided within each unit.

(ii) The external examination of 80 marks shall be of 3 hours' duration. The question paper shall cover the entire syllabus, with each unit carrying equal weightage of 20 marks, and internal choice provided within each unit.

The block contains several handwritten signatures in blue ink. The top row includes five signatures, with the third one clearly legible as 'Sandeep Sharma'. The bottom row includes four signatures, with the last one being a large, stylized signature that appears to be 'Abhishek'. There is also a small, circular stamp or signature in the bottom left corner.

Syllabus of B.Sc. Honours (FYUGP) in Mathematics

Semester-II

For examinations to be held in May 2027, 2028 & 2029

Course Code: UMJMAPR-211

Course Title: Advanced LaTeX

Course Credits: 02

Total Number of Lectures:60

Maximum Marks: 50 (External: 25 & Internal:25)

UNIT-I

(30 Hours)

Mathematical Typesetting and Advanced LaTeX: Introduction to LaTeX and mathematical typesetting. Writing and formatting mathematical expressions in inline and display modes. Typesetting matrices, determinants, piecewise functions, summations, integrals, limits, vectors, tensors, and multiline equations. Use of AMS-LaTeX packages for advanced mathematical notation. Conversion of handwritten and symbolic mathematical expressions into proper LaTeX code. Preparation of theorem-like environments, including definitions, lemmas, propositions, theorems, corollaries, remarks, and proofs.

UNIT-II

(30 Hours)

Document Preparation and Scientific Publishing in LaTeX: Page layout and document formatting, including margins, spacing, headers, footers, and page numbering. Bibliography management using BibTeX and related tools. Citations, indexing, hyperlinks, labels, and cross-referencing. Preparation of professional reports, research articles, dissertations, and books using LaTeX. Design and preparation of academic and scientific presentation slides using Beamer.

Text Book:

1. Lammport, L. (1994). *LaTeX: A Document Preparation System: User's Guide and Reference Manual* (2nd ed.). Reading, MA: Addison-Wesley.

Reference Books:

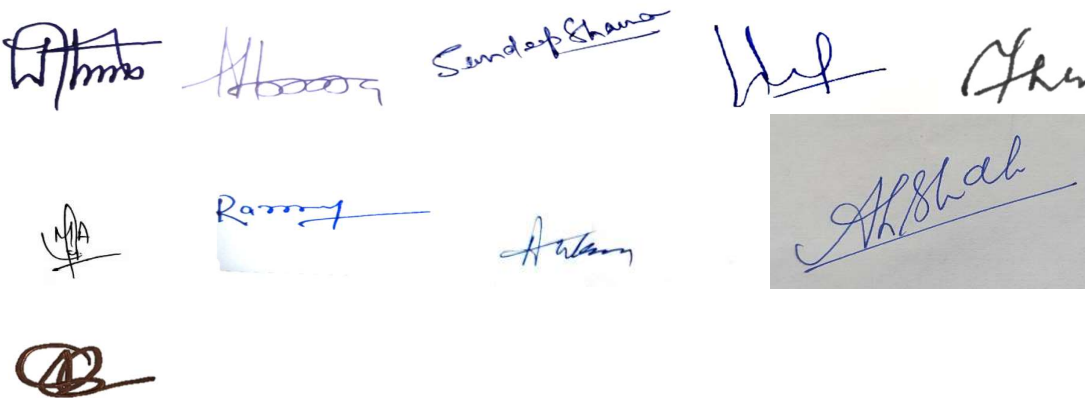
1. Mittelbach, F., & Goossens, M. (2004). *The LaTeX Companion* (2nd ed.). Addison-Wesley.
2. Grätzer, G. (2016). *More Math Into LaTeX* (5th ed.). Springer.
3. Oetiker, T., Partl, H., Hyna, I., & Schlegl, E. *The Not So Short Introduction to LaTeX2ε*.
4. Tantau, T. *The TikZ and PGF Manual*.

Scheme of Examination:

The breakup of the internal assessment of 25 marks shall be as follows:

- (i) Written test - 10 marks;
- (ii) Attendance - 5 marks;
- (iii) Daily performance - 5 marks; and
- (iv) Viva voce - 5 marks.

For the external examination, a practical examination of 25 marks shall be conducted by the examiner.

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Syllabus of B.A/B.Sc. Honours (FYUGP) in Mathematics

Semester-II

For examinations to be held in May 2027, 2028 & 2029

Course Code: UMIMATH-221

Course Title: Integral Calculus &
Geometrical Applications

Course Credits: 04

Total Number of Lectures: 60

Maximum Marks: 100 (External:80 & Internal: 20)

UNIT-I (15 Hours)

Polar coordinates: The concept of Cartesian & Polar coordinates and relation between them; Angle between the radius vector and the tangent; angle of intersection of curves; Length of the perpendicular from the pole to the tangent; polar sub - tangent and polar sub - normal; Pedal equations; Polar curves - Cardioids, Lemniscates of Bernoulli, Spiral of Archimedes, Hyperbolic spiral, Equiangular spiral, Three / four leaved rose; Length of an arc in polar form; Problems based on the above mentioned topics.

UNIT-II (15 Hours)

Partial Derivatives: The concept of Limit, continuity and partial derivative of a real valued function of 2 and 3 variables; Homogeneous Functions- Euler's Theorem, Total differential; Differentiation of composite functions and implicit functions; Problems based on the above mentioned topics.

UNIT-III (15 Hours)

Applications of Partial Derivatives: Directional derivative & Gradient of a function of 2 and three variables; Tangent Planes and Linear Approximations; Taylor's theorem for a function of two variables (Statement only); Local Maximum / Minimum Values of a function of two variables - second derivative test; Double points - Node, cusp and conjugate; Problems based on the above mentioned topics.

UNIT-IV (15 Hours)

Asymptotes, Curve Tracing & Envelope: Vertical, Horizontal and Oblique asymptotes; Curve tracing of Cartesian equations of the form $y^2 = f(x)$ & $y^2 + yf(x) + g(x) = 0$; Envelope - Envelope of a one / two parameter family of curves; Problems based on the above mentioned topics.

Text Books:

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W. H. H.

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Sandeep Sharma

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Anthony

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Syllabus of B.A/B.Sc. Honours (FYUGP) in Mathematics

Semester-II

For examinations to be held in May 2027, 2028 & 2029

Course Code: UMIMAPR-231

Course Title: Advanced Digital Tools

Credits: 02

Total Number of Lectures: 60

Maximum Marks: 50 (External: 25 & Internal: 25)

UNIT-I (30 Hours)

Mathematical Typesetting and Advanced LaTeX: Introduction to LaTeX and mathematical typesetting. Writing and formatting mathematical expressions in inline and display modes. Typesetting matrices, determinants, piecewise functions, summations, integrals, limits, vectors, tensors, and multiline equations. Use of AMS-LaTeX packages for advanced mathematical notation. Conversion of handwritten and symbolic mathematical expressions into proper LaTeX code. Preparation of theorem-like environments, including definitions, lemmas, propositions, theorems, corollaries, remarks, and proofs.

UNIT-II (30 Hours)

Document Preparation and Scientific Publishing in LaTeX: Page layout and document formatting, including margins, spacing, headers, footers, and page numbering. Bibliography management using BibTeX and related tools. Citations, indexing, hyperlinks, labels, and cross-referencing. Preparation of professional reports, research articles, dissertations, and books using LaTeX. Design and preparation of academic and scientific presentation slides using Beamer.

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02: Grätzer, G. (2016). *More Math Into LaTeX (5th ed.)*. Springer.

03: Oetiker, T., Partl, H., Hyna, I., & Schlegl, E. *The Not So Short Introduction to LaTeX2ε*.

04: Tantau, T. *The TikZ and PGF Manual*.

Scheme of Examination:

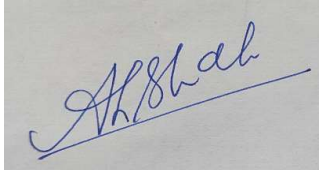
The breakup of the internal assessment of 25 marks shall be as follows:

- (i) Written test - 10 marks;
- (ii) Attendance - 5 marks;
- (iii) Daily performance - 5 marks; and
- (iv) Viva voce - 5 marks.

For the external examination, a practical examination of 25 marks shall be conducted by the examiner.

Syllabus of B.A/B.Sc. Honours (FYUGP) in Mathematics

Semester-II

For examinations to be held in May 2027, 2028 & 2029

Course Code: UMDMATH-241

Course Title: Logical and Analytical Ability

Course Credits: 03

Total number of Lectures: 45

Maximum Marks: 75 (External: 60 & Internal: 15)

UNIT-I (15 Hours)

Logical Reasoning and Analytical Ability: Identifying patterns, logical arguments, Coding-Decoding, Direction Sense, Seating Arrangement (Linear/Circular), Clocks, Calendars and analytical puzzles; **General Mental Ability:** Numerical reasoning, patterns, and problem-solving skills; **Data Interpretation:** Pie charts, Bar graphs, Tables, Data sufficiency, Trend analysis; Problems based on the above mentioned topics.

UNIT-II (15 Hours)

Cartesian Product and Logic: Propositions, truth values, truth tables, Conjunction, Disjunction, Implications, Negation, Tautology, Contradiction, Contrapositive, Quantifiers; Problems based on the above mentioned topics.

UNIT-III (15 Hours)

Fundamentals of Sets: The idea of a set; Operations on Sets - Union Intersection, Difference of sets; Complement of a set; Venn Diagram; De-Morgan law's Cardinality of a set; Cartesian product of two sets; Problems based on the above mentioned topics.

Text Books:

1. Sharma, A. (2020): How to prepare for logical reasoning for CAT. McGraw Hill.
2. Liu, C. L., & Mohapatra, D. P. (2017) : Elements of discrete mathematics. McGraw- Hill.

Reference Books:

1. Kolman, B., Busby, R. C., & Ross, S. (2016): *Discrete mathematical structures* (6th ed.). Pearson.
2. K. H. Rosen: *Discrete Mathematics & its applications*, 5th Ed. 2004, Tata Mc Graw Hill.
3. Lipschitz, Seymour: *Discrete Mathematics*, 2nd Ed. Tata McGraw Hill, New Delhi.

Syllabus of B.A/B.Sc. Honours (FYUGP) in Mathematics

Semester-II

For examinations to be held in May 2027, 2028 & 2029

Course Code: USEMAPR-251

Course Title: Mathematical
Analysis and Optimization

Course Credits: 3

Total Number of Lectures: 75

Maximum Marks: 75 (External: 40 & Internal: 35)

UNIT-I (15 Hours)

Functions, Graphs and Differential Calculus; Functions: Concept of a function; domain, codomain and range (intuitive idea); graphical representation and interpretation of functions; increasing and decreasing functions.

Graphs of Common Functions: Linear, quadratic, cubic, absolute value, exponential, logarithmic and basic trigonometric functions; effect of transformations (translation, stretching and reflection) on graphs; interpretation of graphs in real-life situations.

Rate of Change: Average rate of change and instantaneous rate of change; geometric interpretation of slope; concept of derivative as the rate of change and slope of the tangent.

Basic Differentiation: Derivatives of polynomial, exponential, logarithmic and basic trigonometric functions; simple rules of differentiation (sum, difference, product and quotient); interpretation of derivatives in practical situations.

UNIT-II (Practical/Tutorial) (60 Hours)

Students shall perform the following practical exercises using **GeoGebra**, **Microsoft Excel**, **Google Sheets**, or equivalent open-source software.

1. Plotting and interpretation of linear, quadratic, cubic, absolute value, exponential, logarithmic, and basic trigonometric functions.
2. Identification of domain and range of functions through graphical visualization.
3. Investigation of the effect of translation, reflection, stretching, and compression on the graphs of functions.
4. Estimation of the average rate of change of a function from graphs and numerical data.
5. Visualization of the instantaneous rate of change using tangent lines.

6. Graphical interpretation of the derivative as the slope of the tangent to a curve.
7. Identification of increasing and decreasing intervals of functions through graphical analysis.
8. Determination of local maxima and minima using graphical and computational techniques.

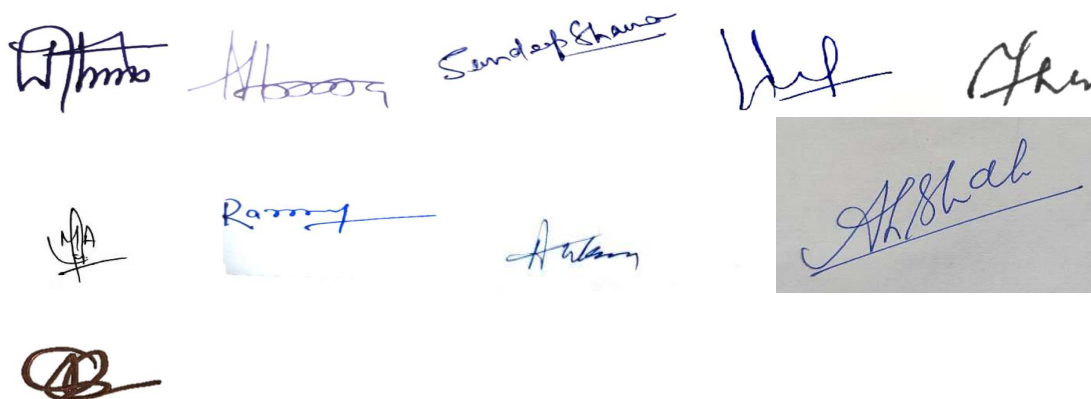
Students shall maintain a **Practical Record File** containing all practical exercises duly certified by the course teacher.

Textbooks

1. **Narayan, S. & Mittal, P.K.** Differential Calculus – S. Chand
2. **Sharma, R. D.** A text book of Applied Mathematics
3. **Mendelson, E.** Schaum's Outline of Calculus. McGraw -Hill Education, USA, Latest Edition.

Reference Books`

1. **Anton, H., Bivens, I. and Davis, S.** Calculus. Wiley.
2. **Apostol, T. M.** Calculus, Volume I. Wiley.

The image displays a collection of handwritten signatures in blue and brown ink. The signatures are arranged in three rows. The top row contains five signatures, including one that appears to be 'Sandeep Sharma'. The middle row contains four signatures, with the last one being a larger, more stylized signature. The bottom row contains a single, large, bold signature in brown ink.