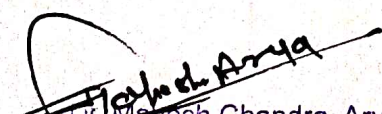



Bharat Singh Rawat Rajkiya Mahavidyalaya Rikhnikhal, Pauri Garhwal

Department of Mathematics

Programme Name: B. Sc. Mathematics (UG)

Programme Outcomes	
PO <sub>1</sub>	It is to give in-depth knowledge of analysis, algebra, calculus, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas such as computer science and other allied subjects.
PO <sub>2</sub>	The skills and knowledge gained in this program will be helpful for modeling and solving of real-life problems.
PO <sub>3</sub>	Students will become employable in various government and private sector.
PO <sub>4</sub>	The completing this programme develop enhanced quantitative skills and pursuing higher mathematics and research as well
PO <sub>5</sub>	The completion of this programme will enable the learner to use appropriate digital programmes and software's to solve various mathematical problems.
PO <sub>6</sub>	Student should be able to think in a critical manner and develop problem solving skills.
PO <sub>7</sub>	Students should be able to recall basic facts about mathematics and display knowledge of conventions such as notations, terminology etc.
PO <sub>8</sub>	Students are able to formulate and develop mathematical arguments in a logical manner.
PO <sub>9</sub>	Students are motivate and prepare for research studies in mathematics and related fields.

  
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## Course Outcomes

**Year: First Year**

**Course Title: Differential Calculus**

**Paper : I**

**Paper Code: BM101**

**Status: Compulsory Course**

**Course Instructors: Dr. Mahesh Chandra Arya, Assistant Professor**

**Email: [mearya1986@gmail.com](mailto:mearya1986@gmail.com)**

**After Successful completion of this course. Students will be able to:**

CO <sub>1</sub>	To learn basic properties of real numbers and its subsets which is backbone of Real Analysis.
CO <sub>2</sub>	To learn the evaluation of Successive differentiation, Leibnitz's theorem, Partial differentiation and Euler's theorem on homogeneous functions, their applications.
CO <sub>3</sub>	To study functions in detail which is a fundamental structure in all sciences, and to be able to check continuity of a function.
CO <sub>4</sub>	To apply notion of derivative in mean value theorem and also in higher order derivatives which arise in all applied sciences
CO <sub>5</sub>	To understand the Concepts of Tangents and normal, Curvature, Asymptotes, Singular points, Maxima and minima.
CO <sub>6</sub>	Find the Tracing of curves, Parametric representation of curves and tracing of parametric curves, polar coordinates and tracing of curves in polar coordinates.

**Year: First Year**

**Course Title: Integral Calculus and Trigonometry**

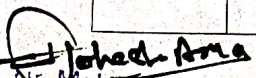
**Paper : II**

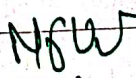
**Paper Code : BM102**

**Status: Compulsory Course**

**After Successful completion of this course. Students will be able to:**

CO <sub>1</sub>	To understand the concept of integral as a limit of sum and properties of definite integrals.
CO <sub>2</sub>	Know the infinite integrals and differentiation and integration under the integral sign.
CO <sub>3</sub>	To understand the concept of Beta function, Gamma function, their properties. their relation and evaluation of them.
CO <sub>4</sub>	To find the length, Area and Volume of curves in the plane.
CO <sub>5</sub>	Evaluate double integrals and repeated integrals.
CO <sub>6</sub>	To understand the concept of Separation into real and imaginary parts, Logarithmic of complex quantities,
CO <sub>7</sub>	To understand different Trigonometrical functions and Trigonometric series and their applications.

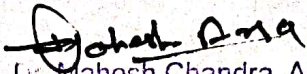
  
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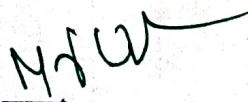
  
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Year: First Year  
Course Title: Algebra and Matrix  
Paper : III  
Paper Code : BM103  
Status: Compulsory Course

After Successful completion of this course. Students will be able to:

CO <sub>1</sub>	To understand the basic concept Sets, Operations on sets, Relations, Equivalence relations and partition Functions.
CO <sub>2</sub>	To learn fundamental properties and mathematical tools such as closure, identity, inverse and generators.
CO <sub>3</sub>	To study algebraic structure 'Groups' in detail which is useful in study of Rings, Modules, Algebraic topology, Analysis.
CO <sub>4</sub>	To enhance abstract thinking of students.
CO <sub>5</sub>	To learn definition of Group, Subgroups, Permutation group, Order of an element, Cyclic group, Coset decomposition, Lagrange's theorem and its consequences.
CO <sub>6</sub>	To understand the theorems and examples of above related topics.
CO <sub>7</sub>	To learn to compare two different algebraic structures and study transfer of properties in-between these structures through homomorphism and isomorphism.
CO <sub>8</sub>	Know the concept of matrix and define different type of matrices.
CO <sub>9</sub>	To learn Rank of a matrix, Invariance of rank under elementary transformations, Adjoint of matrices, Inverse of matrices, Reduction to normal form.
CO <sub>10</sub>	Application of matrices to find the solutions of system of linear homogeneous equations and system of linear non- homogeneous equations.
CO <sub>11</sub>	To find the Eigen Values, Eigen Vectors, Characteristics equations, Cayley Hamilton Theorem and its applications.

  
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Year: Second Year  
 Course Title: Differential Equations  
 Paper : I  
 Paper Code : BM202  
 Status: Compulsory Course  
 Course Instructors: Dr. Mahesh Chandra Arya, Assistant Professor  
 Email: [mcarya1986@gmail.com](mailto:mcarya1986@gmail.com)

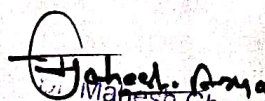
After Successful completion of this course. Students will be able to:

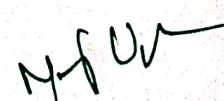
CO <sub>1</sub>	To understand the concept of First order and first-degree differential equations and Integrating factors.
CO <sub>2</sub>	To learn rules to find an integrating factor.
CO <sub>3</sub>	To understand the concept of First order higher degree equations solvable for x, y, p, methods for solving higher-order differential equations.
CO <sub>4</sub>	To find the solution basic theory of linear differential equations, Wronskian, and its properties.
CO <sub>5</sub>	To find the solution linear homogenous equations with constant coefficients.
CO <sub>6</sub>	To understand the linear non-homogenous equations and the method of variation of parameters.
CO <sub>7</sub>	To understand the Cauchy-Euler equation, Simultaneous differential equations, Total differential equations, Order and degree of partial differential equations and their examples.
CO <sub>8</sub>	To understand the Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method and its applications.

Year: Second Year  
 Course Title: Real Analysis  
 Paper : II  
 Paper Code : BM202  
 Status: Compulsory Course

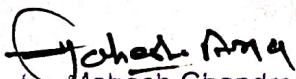
After Successful completion of this course. Students will be able to:


CO <sub>1</sub>	To learn topology of real numbers.
CO <sub>2</sub>	To study various types of sets and relations, and concept of countable and uncountable.
CO <sub>3</sub>	Understand the concept of continuity and differentiability of functions:
CO <sub>4</sub>	To study concept of sequence and series and hence find sum of infinite terms with different methods.
CO <sub>5</sub>	To learn Riemann Integral and its properties in detail, leading to fundamental theorem of calculus and Mean value theorems.
CO <sub>6</sub>	To study different tests for solving improper integrals of first and second kind.
CO <sub>7</sub>	To study pointwise and uniform convergence of sequences and series of functions.

  
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<b>Year: Second Year</b> <b>Course Title: Advanced Algebra</b> <b>Paper : III</b> <b>Paper Code : BM203</b> <b>Status: Compulsory Course</b>	
<b>After Successful completion of this course. Students will be able to:</b>	
CO <sub>1</sub>	To study the algebraic structure Ring in detail through various examples.
CO <sub>2</sub>	To learn the construction of field of quotients of an integral domain.
CO <sub>3</sub>	To study the Rings of polynomials and its factorization over a field.
CO <sub>4</sub>	To study the notion of ideals and factor rings with examples.
CO <sub>5</sub>	To study Unique Factorization domain, Euclidean Domain and related results
CO <sub>6</sub>	To study the algebraic structure Ring in detail through various examples.
CO <sub>7</sub>	To learn the construction of field of quotients of an integral domain.

  
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**Year: Third Year**  
**Course Title: Linear Algebra and linear programming Problems**  
**Paper : I**  
**Paper Code : BM301**  
**Status: Compulsory Course**  
**Email: [mcarya1986@gmail.com](mailto:mcarya1986@gmail.com)**

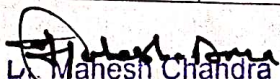
**After Successful completion of this course. Students will be able to:**


CO <sub>1</sub>	To learn the importance of linear transformation in Physics, Engineering, Social sciences and various branches of Mathematics.
CO <sub>2</sub>	To understand the basic concepts of Vector spaces, Subspaces, Algebra of subspaces, Quotient spaces, Linear combination of vectors, Linear span, Linear independence, Basis and dimension and Dimension of subspaces.
CO <sub>3</sub>	To learn to find Eigen values and Eigen vectors of a matrix which is used in the study of vibrations, chemical reactions and geometry.
CO <sub>4</sub>	To get well equipped with Mathematical Modelling abilities.
CO <sub>5</sub>	To learn conversion of real-life problems into mathematical models which enhance their problem solving and decision-making abilities.
CO <sub>6</sub>	To learn Linear programming problems, Graphical approach for solving, some LPP, Convex sets, Supporting and separating hyper planes, Theory of simplex method, Optimality and unboundedness.
CO <sub>7</sub>	To understand the simplex algorithm, Simplex method in tableau format, Introduction to artificial variables, Two-phase method, Big-M method and their comparison, Duality, formulation of the dual problem and Primal-dual relationships.
CO <sub>8</sub>	Students learn to calculate optimal solution of models through graphical and iterative methods.

**Year: Third Year**  
**Course Title: Complex Analysis**  
**Paper : II**  
**Paper Code : BM302**  
**Status: Compulsory Course**

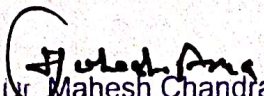
**After Successful completion of this course. Students will be able to:**


CO <sub>1</sub>	To learn basic algebraic properties of complex numbers and limit and continuity of Complex functions.
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CO <sub>2</sub>	To learn analytic functions and the C-R equations as its necessary and sufficient conditions. To learn tools which are useful in finding integration of Complex valued functions.
CO <sub>3</sub>	To learn sequences and series of Complex valued functions.
CO <sub>4</sub>	To learn applications of residues and poles in integrals of complex functions.
<b>Year: Third Year</b> <b>Course Title: Numerical Analysis</b> <b>Paper : III</b> <b>Paper Code : BM302</b> <b>Status: Compulsory Course</b>	
After Successful completion of this course. Students will be able to:	
CO <sub>1</sub>	To learn to apply the various numerical techniques for solving real life problems.
CO <sub>2</sub>	The problems which cannot be solved by usual formulae and methods can be solved approximately by using numerical techniques.
CO <sub>3</sub>	To fit curve to the data by using 5 different methods of interpolation as well as extrapolation.
CO <sub>4</sub>	To find approximate solutions to difficult differential equations occurring in engineering sciences.
CO <sub>5</sub>	To Solve Algebraic and transcendental equations by Bisection method, False position method, Newton-Raphson method. Picard's iteration method.
CO <sub>6</sub>	Check the consistency and inconsistency of system of linear equation,
CO <sub>7</sub>	Find the solution of linear system of equations by direct and iterative methods
CO <sub>8</sub>	Find finite differences, differences of a polynomial and errors in polynomial interpolation
CO <sub>9</sub>	Apply Newton's forward and Backward interpolation formula, Gauss, Stirling, Bessel's, Everett's and Lagrange' s interpolation formula
CO <sub>10</sub>	Numerically differentiate and numerically integrate a function by using a set of tabulated values of functions.

  
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