BACHELOR IN SCIENCE (B.Sc.) ST. ALOYSISUS' COLLEGE (AUTONOMOUS)
JABALPUR , M. P., INDIA
Reaccredited 'A+' by NAAC with CGPA (3.68/4.0)
College with Potential for Excellence by UGC
DST-FIST supported
BACHELOR IN SCIENCE (B.Sc.)
2021 – 22

Max .Marks	:	40
Class	:	BSc/B.A
Year	:	Second
Subject	:	Mathematics
Paper	:	I
Title	:	Abstract Algebra

Course Objective:

A blended teaching method will be used so that students can generalize results and prove them. and It will give the student experience, knowledge, and confidence to move forward in the study of mathematics.

Course Learning Outcomes:

Upon successful completion of this course, the student will be able to:

CLO1 Understand important mathematical concepts in abstract algebra such as definition of a group, order of a group, order of an element, ring, integral domain and field.

CLO2 Comprehend different types of subgroups such as normal subgroups, cyclic subgroups and their structure and characteristics.

CLO3 Appreciate the concepts of permutation groups, factor groups, Abelian groups homomorphism and isomorphism in groups and rings.

CLO4 Analyze and demonstrate examples of rings and fields.

CLO5 Make the students see and understand the connection and transition between previously studied mathematical concepts and more advanced mathematics

Unit 1: Definition and basic properties of groups,subgroups, subgroups generated by a subset,Cyclic groups and simple properties

Unit 2: Coset decomposition,Lagrange's theorem and its corollaries including Fermat's theorem,Normal subgroups,Quotient groups.

Unit 3:Homomorphism and Isomorphism of groups, Fundamental theorem of homomorphism,Transformation and Permutation group,

S_n(Various subgroups of S_n,$n<5$ to be studied), Cayley's Theorem.

Unit 4: Group Automorphism,Inner Automorphism,group of Automorphisms,Conjugacy relation and centralizer, Normaliser,Counting

principle and class equation of a finite group,

Cauchy's theorem for finite group,Cauchy's theorem for finite abelian groups and non abelian groups.

Unit 5: Definition and basic properties of rings,Ring homomorphism subrings, Ideals and quotient rings,Polynomial rings & its properties,

Integral domain and Field.

Test Books:

1. I.N.Herstein –Topics in Algebra,Wiley Eastern Ltd.New Delhi 1977
2. PB Bhattacharya. S.K Jain and S.R Nagpaul-Basic Abstract Algebra,Wiley Eastern,New Delhi 1997

Reference Books :

1.Shantinarayan –A text Book of Modern Abstract Algebra,S.Chand and Company New Delhi.

2. Surjeet Singh-A Text Book of Modern Algebra

3. N.Jacobson-Basic Algebra Vol.I and II W.H.Freeman

4.I.S Luther and I.B.S Passi-Algebra Vol I and II Narosa Publishing House

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2021–22

Max . Marks	:	40
Class	:	BSc/B.A
Year	:	Second
Subject	:	Mathematics
Paper	:	II
Title	:	**Advanced calculus**

Course Objective:

Understand the tests of convergence of infinite sequence and series. And to make the students see and understand the concept of continuity and differentiation of function of two variables and its application in real world.

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to

CLO1 Understand of the theory of sequence and convergence of series.
CLO2 Appreciate principles of multi-variable calculus containing differentiability and prove.
CLO3 Understand the relationship between beta and Gamma function
CLO4 Reason abstract mathematical arguments and prove them.
CLO5 Understand the relationship between the increasing and decreasing behaviour of function.

Unit 1: Definition of a sequence, Theorems on limits of sequences, i ndeterminate forms. Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test, Cauchy's intergral test, Cauchy's root test, ratio tests, Raabe's tests, logarithmic tests, Alternating series. Leibnitz's test, Absolute and conditional convergence, absolute and conditional convergence of series of real and complex terms, rearrangement of series.

Unit 2: Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability, Role's Theorem, Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.

Unit 3: Limit and continuity of functions of two variables, Partial differentiation, Change of variables, Euler's theorem on homogeneous functions, Taylor's theorem for function of two variables .Jacobians .

Unit 4: Envelopes, Evolutes, Maxima and Minima of functions of two variables, Lagrange's multiplier method, Beta and Gamma Functions.

Unit 5: Double and triple integrals, volumes and surfaces of solids of revolution Dirichlet's integrals, change of order of integration in double integrals.

Test Books:

1. R. R. Goldbeg -Real Analysis, Oxford& I.B.H. Publishing co., New Delhi
2. Gorakh Prasad- Differential Calculus, Pothishala Pvt. Ltd. Allahabad.
3. Gorakh Prasad- Integral Calculus, Pothishala Pvt. Ltd. Allahabad

Reference Books :

1. Gabriel Klaumber- Mathematical Analysis, Marcel Dekkar, Inc. NewYork, 1975
2. T. M. Apostol- Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. D. Soma Sundaram and B. Choudhary- A first Course in mathematical Analysis, Narosa Publishing, House, New Delhi, 1997.
4. Murray R. Spiegel- Theory and problems of advance Calculus, Schauma Publishing Co., New York
5. O.E. Stanaitis – An Introduction to Sequence, Series and improper Integrals.

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Max .Marks	:	40
Class	:	BSc/B.A
Year	:	Second
Subject	:	Mathematics
Paper	:	III
Title	:	**Differential Equations**

Course Objective:

Introduce students to solution of differential equations by Power Series method, Laplace Transform, Inverse Laplace Transform of derivatives and Integrals. and Introduce students to how to solve Partial Differential Equations of First, Second and Higher Order, Charpit's General Method.

Course Learning Outcomes:

Upon completion of the course, students will be able to

CLO1 Evaluate differential equations by Power Series Method. Find solution of Legendre's and Bessel's Differential Equations.

CLO2 Solve Laplace Transform of continuous functions, discontinuous functions, derivatives, integrals and inverse Laplace Transform.

CLO3 Classify partial differential equations and transform into canonical form.

CLO4 Find solution of linear partial differential equations of both first and second order.

CLO5 Apply Laplace Transform and inverse Laplace Transform in solving linear differential Equations.

Pratibha Mandal

Unit – I: Series solutions of differential equations, Power series method, Bessel and Legendre equations, Bessel's and Legendre's functions and their properties-recurrence and generating function. Orthogonality of functions.

Unit – II: Laplace Transformation, Linearity of the Laplace transformation, existence theorem for Laplace Transforms, Laplace Transforms of derivative and integrals, Shifting theorems, Differentiation and integration of transformations.

Unit – III: Inverse Laplace Transforms, Convolution theorem, Application of Laplace Transformations in solving linear differential equations with constant coefficients.

Unit – IV: Partial differential equations of the first order, Lagrange's solution. Some special types of equations which can be solved easily by methods other than general method, Charpit's general method.

Unit – V: Partial differential equations of second and higher orders, Classification of partial differential equations of second order, Homogeneous and non-homogeneous equations with constant coefficients, Partial differential equations reducible to equation with constant coefficients.

Text Book:

1. Sharma and Gupta, Integral Transform, Pragati Prakashan Meerut.
2. Sharma and Gupta, Differential Equation, Pragati Prakashan Meerut.
3. Raysinghania, Differential Equation, S. Chand & Company, New Delhi.