



## B.A. (Additional) Mathematics

### 1<sup>st</sup> Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BAAM101	Calculus	40	60	100
BAAM102	Algebra	40	60	100
<b>Total</b>		<b>80</b>	<b>120</b>	<b>200</b>

### 2<sup>nd</sup> Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BAAM201	Analytic Geometry and Applied Algebra	40	60	100
BAAM202	Differential Equations	40	60	100
<b>Total</b>		<b>80</b>	<b>120</b>	<b>200</b>



## Semester-I

### Paper I Calculus

#### SECTION – I

Limit and Continuity, Types of discontinuities. Differentiability of functions. Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.

#### SECTION - II

Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves.

#### SECTION – III

Rolle's theorem, Mean Value Theorems, Taylor's Theorem with Lagrange's & Cauchy's forms of remainder. Taylor's series, Maclaurin's series of  $\sin x$ ,  $\cos x$ ,  $e^x$ ,  $\log(1+x)$ ,  $(1+x)^m$ , Applications of Mean Value theorems to Monotonic functions and inequalities. Maxima & Minima. Indeterminate forms.

#### Books Recommended:

1. George B. Thomas, Jr., Ross L. Finney : Calculus and Analytic Geometry, Pearson Education (Singapore); 2001.
2. H. Anton, I. Bivens and S. Davis : Calculus, John Wiley and Sons (Asia) Pte. Ltd. 2002.
3. R.G. Bartle and D.R. Sherbert : Introduction to Real Analysis, John Wiley and Sons (Asia) Pte. Ltd. 1982



## Paper II Algebra

### SECTION - I

Definition and examples of a vector space, Subspace and its properties, Linear independence and dependence of vectors, basis and dimension of a vector space. Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns up to four. Cayley-Hamilton theorem, Characteristic roots and vectors.

### SECTION - II

De Moivre's theorem (both integral and rational index). Solutions of equations using trigonometry, Expansion for  $\cos nx$ ,  $\sin nx$  in terms of powers of  $\sin x$ ,  $\cos x$ , and  $\cos nx$ ,  $\sin nx$  in terms of Cosine and Sine of multiples of  $x$ , Summation of series, Relation between roots and coefficients of  $n^{\text{th}}$  degree equation.

Solutions of cubic and biquadratic equations, when some conditions on roots of the equation are given, Symmetric functions of the roots for cubic and biquadratic equations.

### SECTION - III

Integers modulo  $n$ , Permutations, Groups, subgroups, Lagrange's Theorem, Euler's Theorem, Symmetry Groups of a segment of a line, and regular  $n$ -gons for  $n=3, 4, 5$  and  $6$ . Rings and subrings in the context of  $C[0,1]$  and  $Z_n$ .

#### Recommended Books:

1. Abstract Algebra with a Concrete Introduction, John A. Beachy and William D. Blair, Prentice Hall, 1990.
2. Modern Abstract Algebra with Applications, W.J. Gilbert, John Wiley & Sons 1976.



## Semester-II

### Paper I Analytic Geometry and Applied Algebra

#### SECTION-I : Geometry

Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola and their applications to signals, classification of quadratic equation representing lines, parabola, ellipse and hyperbola.

#### SECTION-II : 3-Dimensional Geometry and Vectors

Rectangular coordinates in 3-space; spheres, cylindrical surfaces cones. Vectors viewed geometrically, vectors in coordinate system, vectors determine by length and angle, dot product, cross product and their geometrical properties. Parametric equations of lines in plane, planes in 3-space.

#### SECTION - III : Applied Algebra

Latin Squares, Table for a finite group as a Latin Square, Latin squares as in Design of experiments, Mathematical models for Matching jobs, Spelling Checker, Network Reliability, Street surveillance, Scheduling Meetings, Interval Graph Modelling and Influence Model, Picher Pouring Puzzle,.

#### Recommended Books:

1. Calculus, H. Anton, 1. Birens and S.Davis, John Wiley and Sons, Inc. 2002.
2. Applied Combinatorics, A Tucker, John Waley & Sons, 2003.



## Paper II Differential Equations

### Ordinary differential equations

First order exact differential equations including rules for finding integrating factors, first order higher degree equations solvable for  $x$ ,  $y$ ,  $p$ , Wronskian and its properties, Linear homogeneous equations with constant coefficients, Linear non-homogeneous equations. The method of variation of parameters. Euler's equations. Simultaneous differential equations. Total differential equations.

### Partial differential equations

Order and degree of partial differential equations, Concept of linear and non linear partial differential equations, formation of first order partial differential equations. Linear partial differential equations of first order, Lagrange's method, Charpit's method, classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

#### Recommended Books:

1. Calculus, H. Anton, 1. Birens and S.Davis, John Wiley and Sons, Inc. 2002.
2. Differential Equations, S.L.Ross, John Wiley and Sons, Third Edition, 1984.
3. Elements of Partial Differential Equations, I.Sneddon, McGraw-Hill International Editions, 1967.