TRIPURA UNIVERSITY
(A Central University)
Suryamaninagar - 799022

Syllabus
of

MATHEMATICS
(General & Major)

Semester I

Year 2014

CONTENT

B.A. / B. Sc. Mathematics (General)

Semester-I

Paper-I: Mark : 20+80=100
Unit-I(20+20=40): Classical Algebra & Vector Algebra
Unit-II(20+20=40): Abstract Algebra & Linear

Semester-II

Paper-II: Mark : 20+80=100
Unit-I(20+20=40):Differential Calculus
Unit-II(20+20=40):Integral Calculus

Semester-III

Paper-III:Mark : 20+80=100
Unit-I(20+20=40):Geometry-Two Dimension and Three Dimension
Unit-II(20+20=40):Differential Equations

Semester-IV

Paper-IV:Mark : 20+80=100
Unit-I(20+20=40):Linear Programming Problem
Unit-II(20+20=40):Probability Theory & Vector Calculus

Semester-V

Paper-V: Mark : 50(Theory)+50(Practical)=100
Theory Mark : 10+40=50
Unit-I(20): Numerical analysis
Unit-II(20): Computer Science
Practical(40):(Practical-Simple C-Programming
and Numerical analysis through C Programming)

Semester-VI

Paper-VI: Mark : 20+80=100
PROJECT

B.A. / B. Sc. Mathematics (Major)

Semester-I
Paper-I:Mark : 20+80=100
Unit-I(20): Classical Algebra & Number Theory
Unit-II(20):Abstract Algebra-I
UNIT-III(20):Abstract Algebra-II
Unit-IV(20) :Vector Algebra

Semester-II
Paper-II:Mark : 20+80=100
Unit-I (20) : Linear Algebra-I
Unit II (20): Linear Algebra-II
Unit-III(20):Geometry-Two Dimension
Unit-IV(20):Geometry-Three Dimension

Semester-III
Paper-III:Mark : 20+80=100
UNIT I(20): Calculus-I
Unit-II(20):Calculus-II
Unit-III(20):Calculus-III
Unit-IV(20):Vector Calculus

Semester-IV
Paper-IV:Mark : 20+80=100
Unit-II(20): Differential Equations-I
Unit-II(20):Differential Equations-II
Unit-III(20):Linear Programming Problem-I
Unit-IV(20):Linear Programming Problem-II

Semester-V
Paper-V:Mark : 20+80=100
Unit-I(20):Analysis-I
Unit-II(20):Analysis-II
Unit-III(20):Analysis-III
Unit-IV(20):Analysis-IV

Paper-VI:Mark : 20+80=100
Unit-I(20):Probability
Unit-II(20):Statistics
Unit-III(20):Tensor Analysis
Unit-IV(20):Dynamics of Particle

Semester-VI
Paper-VII:Mark : 20+80=100
Unit-I(20):Numerical analysis-I
Unit-II(20):Numerical Analysis-II
Unit-III(20):C Programming-I
Unit-IV(20):C Programming-II

Paper-VIII:Mark : 20+80=100 (Practical)
Group-A: (Numerical Analysis)Mark=40
Group-B: (C-Programming)Mark=40

Semester-I
MATHEMATICS (General)
Paper-I
Mark : 20+80=100

Unit-I(20+20=40)
(Classical Algebra & Vector Algebra)

1. Inequalities : A. M. $\geq$ G.M $\geq$ H.M. Their generalization like the theorem of weighted mean and m^a power theorem. Statement of Cauchy-Schwartz inequality, Weierstrass inequality and their application. DeMoivre's theorem and its applications.

2. Exponential sine, cosine and logarithm of complex number. Direct and inverse circular and hyperbolic functions. Expansion of trigonometry functions, Gregory's series. Summation of series. Revision of definition of vectors and its algebra. Rectangular solution of vector, linear dependent and independent of vectors. Two vectors are linier dependent iff one is scalar multiple of other. Every super set of linearly dependent set of vectors is linearly dependent. The set of non-zero vectors are linearly iff one of them is scalar combination of others.

3. Scalar and vector product of two vectors. Scalar and vector triple product. Product of four vectors. Reciprocal vectors. Simple applications to geometry. Vector equations of straight line, plane and circle. Applications to mechanics: work done, torque.

Unit-II(20+20=40)
(Abstract Algebra & Linear)

1. Revision of set theory, relation and mapping. Equivalence relation, partition of a set, equivalence classes, composition of functions. Congruence modulo n. Binary operation. Group Theory: Group, Abelian group, identity and inverse element in a group is unique. Subgroups, necessary and sufficient condition of a non-empty subset of a group is a subgroup, cyclic group, order of a group and order of an element.

2. Rings and Fields: Properties of Rings directly following from the definition, Unitary and commutative rings. Divisors of zero, Integral domain, Every field is an integral domain, every finite integrals domain is a field. Definitions of Sub-ring and sub-field. Statement of Necessary of sufficient condition for a subset of a ring (field) to be sub-ring (resp. subfield). Matrix: Matrices of real and complex numbers : Algebra of matrices. Symmetric and skew-symmetric matrices, Solution of linear equation with not more than three unknown by matrix method. Rank of a matrix. Characteristics polynomial, characteristics equations, Eigen value & Eigen Vector. Cayley Hamilton theorem(statement only).

3. Vector space/Linear space (Def. and examples), Linear combination, independence and dependence, linear span, basis and dimention (Def. and examples). Subspace (Def. and examples), intersection and union of subspaces, linear sum of two subspaces, direct sum of subspaces, dimension of sum and subspaces. Linear transformation and their representation as matrices, kernal and range of a linear transformation, the algebra of linear transformations, the rank nullity theorem(statement only).

Reference:
1. Advanced Higher Algebra: Ghosh and Chakraborty, U. N, Dhur.
2. Algebra: R.M.Khan, Central
3. Higher Algebra: Mapa, Ashok Pub.
4. Cordinate Geometry: S.B.Sengupta

Semester-I
MATHEMATICS (Major)
Paper-I
Mark : 20+80=100

Unit-I(20)

(Classical Algebra & Number Theory)

1. Inequalities : A. M. $\geq$ G.M $\geq$ H.M. Their generalization like the theorem of weighted mean and m^{th} power theorem. Statement of Cauchy-Schwartz inequality, Weierstrass inequality and their application. DeMoivre's theorem and its applications. Expotential sine, cosine and logarithm of complex number.

2. Direct and inverse circular and hyperbolic functions. Expansion of trigonometrical functions. Gregory's series. Summation of series. Statements of well ordering principle, first principle of mathematical induction, second principle of mathematical induction. Proofs of some simple mathematical results by induction. The division algorithm, The greatest common divisor (g.c.d.) of two integers a and b. Relatively prime integers.

3. The equation ax+ by = c has integral solution iff (a,b) divides c. (a , b, c are integers). Prime numbers. Euclid's first theorem: If some prime p divides ab, then p divides either a or b. Euclid's second theorem: There are infinitely many prime integers. Unique factorization theorem. Statement of Chinese Remainder Theorem and simple problems. Euler ϕ function.

Unit-II(20)

(Abstract Algebra-I)

1. Set theory: Revision of set theory and algebra, relation and mapping. Order relations, equivalence relations and partitions. Congruence modulo n. Further theory of sets and mapping, Cardinality of sets, countable and uncountable sets, $\aleph_0$ and $\aleph_1$. Binary operation.

2. Group Theory: Semi-group, Definition, examples and simple properties of Group, Some special groups like Z_n, $U(n)$, Dihedral groups, etc., Abelian group. Subgroup, the necessary and sufficient condition of a non-empty subset of a group is a subgroup, intersection and union of two subgroups.

3. Cyclic groups and its various properties. Order of a group and order of an element of a group, Permutation : Cycle, transposition, Statement of the result that every permutation can be expressed as a product of disjoint cycles. Even and odd permutations, Permutation Group. Symmetric group. Alternating Group. Order of an alternating group.

UNIT-III(20)

(Abstract Algebra-II)

1. Group Homomorphism, Automorphism, Endomorphism and Isomorphism. Cosets and their various properties, index of a subgroup, Lagrange's theorem and its applications, Normal subgroups:Definition, examples and properties.

2. Rings and Fields: Properties of Rings directly following from the definition, Unitary and commutative rings. Divisors of zero, Integral domain, Every field is an integral domain, every finite integrals domain is a field.

3. Definitions of Sub-ring and sub-field. Necessary of sufficient condition for a subset of a ring (field) to be sub-ring (resp. subfield). Characteristic of ring and integral domain. Ring and field Homomorphism, Isomorphism. Quotient-ring.

Unit-IV(20)

(Vector Algebra)

1 Vector Algebra: Vector (directed line segment) Equality of two free vectors. Addition of Vectors. Multiplication by a Scalar. Position vector, Point of division, Conditions of collinearity of three points and co-planarity of four points. Rectangular components of a vector in two and three dimensions. Product of two or more vectors. Scalar and vector products, scalar triple products and Vector triple products. Product of four vectors.

2. Direct application of Vector Algebra in (i) Geometrical and Trigonometrical problems (ii) Work done by a force, Moment of a force about a point.

3. Vector equations of straight lines and planes. Volume of a tetrahedron. Shortest distance between two skew lines.

Reference:

1. Advanced Higher Algebra: Ghosh and Chakraborty, U.N.Dhur.
2. Algebra: R.M.Khan, Central
3. Higher Algebra: Mapa, Ashok Pub.
4. Number Theory: S.B.Malik, New Age Pub.
5. Cordinate Geometry: S.B.Sengupta