BHAKTA KAVI NARSINH MEHTA UNIVERSITY
JUNAGADH 362263

SYLLABUS

Faculty of Science
M.Sc. - Mathematics
Semester – I
Under Choice Based Credit System (CBCS)
Effective From June – 2019

Department of Mathematic

Bhakta Kavi Narsinh Mehta University Junagadh

SYLLABUS

M. Sc. (Mathematics)

(CBCS)

With effect from June-2019

DEPARTMENT OF MATHEMATICS

Course Structure and Scheme of Examination
For Choice based Credit System (CBCS)
(With effect from June-2019)

- **Course :** M.Sc. (Mathematics)
- **Eligibility of the admission : - B**.Sc. (Mathematics)
- **Duration : -** Two Years

Semester 1

Subject Code	Title of the Course	Course Credits	No. of Hrs. Per Week	Weightage For Internal Examination	Weightage For Semester End Examination	Total Marks	Duration Of Semester end Exam in hrs.
CMT – 1001	Algebra 1	4	4	30	70	100	2.5hrs
CMT – 1002	Real Analysis	4	4	30	70	100	2.5hrs
CMT – 1003	Topology 1	4	4	30	70	100	2.5hrs
CMT – 1004	Theory of Ordinary Differential Equations	4	4	30	70	100	2.5hrs
CMT – 1005	Seminar and Problem Session	4	4	-	100	100	-
EMT – 1001	Classical Mechanics 1	4	4	30	70	100	2.5hrs
Total		**24**				**600**	

Semester 2

Subject Code	Title of the Course	Course Credits	No. of Hrs. Per Week	Weightage For Internal Examination	Weightage For Semester End Examination	Total Marks	Duration Of Semester end Exam in hrs.
CMT – 2001	Algebra 2	4	4	30	70	100	2.5hrs
CMT – 2002	Complex Analysis	4	4	30	70	100	2.5hrs
CMT – 2003	Topology 2	4	4	30	70	100	2.5hrs
CMT – 2004	Methods in Partial Differential Equations	4	4	30	70	100	2.5hrs
CMT – 2005	Seminar and Problem Session	4	4	-	100	100	-
EMT – 2001	Classical Mechanics 2	4	4	30	70	100	2.5hrs
Total		**24**				**600**	

M.Sc.(Mathematics) - SEMESTER 1

CMT - 1001 Algebra- I

CMT - 1002 Real Analysis

CMT - 1003 Topology- I

CMT - 1004 Theory of Ordinary Differential Equations

CMT - 1005 Seminar and Problem Session

EMT - 1001 Classical Mechanics- I

M.Sc.(Mathematics) - SEMESTER 2

CMT - 2001 Algebra- II

CMT - 2002 Complex Analysis

CMT - 2003 Topology- II

CMT - 2004 Methods in Partial Differential Equations

CMT - 2005 Seminar and Problem Session

EMT - 2001 Classical Mechanics- II

* CMT – Core Subject, EMT –Elective Subject, PMT - Practical

- Passing Standard is 40% in Internal as well as in external examinations for all the courses.
- Student will have to clear internal as well as external examinations. (i.e. internal examination with minimum 40% and external examination with minimum 40% is compulsory) and student can earn credits mentioned against each course.
- There will be two internal examinations in each course and average of both the examinations will be considered.

M.Sc. SEMESTER 1

Sub. Code: **CMT-1001**

Core Sub. 1: **Algebra- 1**

Unit 1

Basic concepts of group theory:
Group, abelian group, cyclic group, normal subgroup, quotient group, permutation group, Group isomorphism and their properties, Cayley's theorem, Automorphisms of groups.

Unit 2

Direct Products, Finitely Generated Abelian Groups, Invariants of a finite Abelian Groups, Sylow Theorems.

Unit 3

Quick look at basic ring theory:
Euclidean ring, Quotient ring and zero divisors, Ideals, principal ideal, maximal ideal and prime ideal, Homomorphisms of ideals, Sum and Direct Sum of Ideals, Nilpotent and Nil Ideals.

Unit 4

Euclidean domains, Principal Ideal Domains, Unique Factorization Domains and Polynomial Rings over UFD. Polynomial rings over rational field, irreducible polynomials, Einstein irreducibility criterion.

Reference Books:

1) P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul, **Basic Abstract Algebra,** Second Edition, Cambridge University Press, 1995.
2) M. Artin, Algebra, Prentice-Hall of India Private Ltd., New Delhi, 1994.
3) J. A. Gallian, Contemporary Abstract Algebra, Fourth Edition, Narosa Publishing House, New Delhi, 1999.
4) N. S. Gopalakrishnan, University Algebra, New Age International Private Ltd. Publishers, New Delhi, Sixth Reprint, 1998.
5) I. N. Herstein, Topics in Algebra, Second Edition, Wiley Pub. , New York, 1975.

M.Sc. SEMESTER 1

Sub. Code: **CMT-1002**
Core Sub. 2: **Real Analysis**

Unit 1

Algebra of sets, σ-algebra of sets, Borel sets, Lebesgue outer measure, Measurable sets and Lebesgue measure, A nonmeasurable set, Measurable Functions, and Littlewood's three principles.

Unit 2

Riemann integral, The Lebesgue integral of a bounded function over a set of finite measure, The integral of a nonnegative function, The general Lebesgue integral, and Convergence in measure.

Unit 3

Differentiation of monotone functions, Functions of bounded variation, Differentiation of an integral, and Absolute continuity.

Unit 4

lL^p spaces, The Holder's inequality, The Minkowski's inequality, and Convergence and completeness.

The course is covered by Chapter 1 Section 4, Chapter 2 Section 7, Chapter 3 (full), Chapter 4(full), Chapter 5 (Sections 1 to 4), and Chapter 6 (Sections 1 to 3) from the book Real Analysis by H. L. Royden, Third Edition, PHI Learning Private Limited (2009) New Delhi.

Reference Books:-

1. Real Analysis by N. L. Carothers, Cambridge University Press (2000).
2. Measure Theory and Integration by G de Barra, Wiley Eastern Limited, First Wiley Eastern Reprint (1987).
3. Real Analysis by V. Karunakaran, Pearson (2012).
4. Fundamentals of Real Analysis by S. K. Berberian, Universitext, Springer (1999).
5. An introduction to Measure and Integration by I. K. Rana, Narosa Publishing House, New Delhi.

M.Sc. SEMESTER 1

Sub. Code: **CMT-1003**
Core Sub. 3: **Topology -1**

Unit-1

Topology, Open sets and closed sets, Finer and Coarser topology, Basis for a topology, Simply ordered topology.

Unit-2

Subspace topology, Product topology, Continuous functions, Homeomorphism.

Unit-3

Limit points, Closure, Interior points and interior, Convergent Sequence.

Unit-4

Metric topology, Uniform convergence, Topology of R^n.

Unit-5

Connectedness, Local connectedness, Components, Path connectedness

The Course is covered by following Chapter 1, 2 and 3(Upto article 25) of Topology-A first course, J. M. Munkres, Printice Hall of India (2000).

Reference Books:-

1) Introduction to Topology and Modern Analysis - G. F. Simmons, Tata McGraw Hill edition-2004.
2) General Topology by S. Willard, Addison – Wesley Publishing Company (1970).

M.Sc. SEMESTER 1

Sub. Code: **CMT-1004**

Core Sub. 4: **Theory of Ordinary Differential Equations**

Unit 1: Linear System of Differential Equations

The existence and uniqueness theorem, Linear Homogenous systems, Linear Non-Homogenous systems, Nonlinear system of first order equations.

Unit 2: Linear System with constant coefficients

The exponential of matrix, Eigen values and eigen vectors of matrices, calculation of fundamental matrix, two dimentional linear systems, some population problems, an electric circuit .

Unit 3: Series solutions of Linear Differential Equations

Review of properties of power series, second order linear equations with analytic coefficients, theorem on solutions in power series, singular points of linear differential equations, solutions about a regular singular point, exceptional cases, the Bessel equation and some properties of Bessel functions, singularities at infinity, irregular singular points with an introduction to asymptotic expansions

Unit 4: Existence theory

Existence of solutions, uniqueness of solutions, continuation of solutions, the non linear simple pendulum, existence theory for system of first order equations and higher order equations, linear systems, dependence on initial conditions.

Unit 5: Laplace Transforms

Linearity, existence theorem, Laplace transform of derivatives and integrals, shifting theorem, differentiation and integraton of transforms, convolution theorem, inverse Laplace transform, solution of Ordinary Differential equations and integral equations.

This course is covered by "**Ordinary Differential Equations**", First course by R. Brauer and J. A. Nohel, Second edition, Benjamin Inc.

Reference Books:-

1) Ordinary Differential Equations by G. Birkoff and G. C. Rota, Second edition, Ginn and Co(1995)
2) Introduction to Ordinary Differential Equations by E. A. Coddington, Prentice Hall of India, 1996.
3) Elements of Ordinary Differential Equations by M Golom and M. E. Shinks, Second Edition, McGraw-Hill Books Co., 1965.
4) Theory and Problems of Differential Equations by F. Ayers, McGraw Hill, 1972.
5) Advanced Engineering Mathematics by E. Kreyzig, John Willey and Sons, 2002.

M.Sc. SEMESTER 1

Sub. Code: **EMT-1001**

Elective Sub.1: **Classical Mechanics -1**

Unit 1: D'Alemberts principle and Lagrange's Equations

- Conservation theorem for linear momentum and angular momentum for a particle.
- Conservation theorem for linear momentum and angular momentum for a system of particles.
- Classification of dynamical system.
- Constraints.
- Virtual displacement and principle of virtual work.
- Generalized force in holonomic system
- Mathematical expression for principle of virtual work
- D'Almbert's principle
- Lagrange's equation for holonomic system
- Lagrange's equation for conservative non-holonomic system
- Problems on above topics

Unit 2: Variational principle and Lagrange's equations

- Variational principle
- Calculus of variations
- Hamilton's principle
- Derivation of Hamilton's principle from Lagrange's equation
- Derivation of Lagrange's equations from Hamilton's principle

- Cyclic co-ordinates
- Conservation theorems
- Problems on above topics

Unit 3: Two Body Central force problem

- Reduction to equivalent one body problem
- The equations of motion and first integrals
- The equivalent one dimensional problem and classification of orbits
- The inverse square law of force.

Unit 4: Equations of Motion and Rigid bodies

Independent co-ordinates of rigid bodies, generalized co-ordinates of a rigid bodies, Euler angles, Cayley-Klein parameters and related quantities, components of angular velocity along the body set of axes, Euler's theorem on the motion of a rigid body, rate of change of a vector, the coriolis force, Euler's equations of motion for a rigid body, finite rotations, infinitesimal rotations.

The course is covered by the above topics from the book:

1. **Classical Mechanics** by H. Goldstein, 2nd Edition, Narosa Publishing House
2. **Classical Mechanics** by C. R. Mondal, Prentice Hall of India Pvt. Ltd.