Swami Ramanand Teerth Marathwada University, Nanded (M.S.).
B.A./B.Sc. Third Year
Syllabus (*Mathematics*)
SEMESTER -V & VI
Effective from June -2015

B.A./B.Sc. Third Year
SEMESTER –V.

Note : (1) Papers XIII (MT 301) and XIV (MT 302) are compulsory.
   (2) Choose either X V(A) OR XV **(B),** from the following papers.
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B.A/B.Sc. T.Y. Semester-V
Paper XIII (MT 301): Metric Spaces
(No. of periods: 60 Max.Marks:40+10=50)
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Unit I: Definitions and examples, open and closed sets.

Unit II: Convergence   and   completeness, Continuity and uniform continuity.

 Unit III: Compactness, Connectedness.

Text Book: Mathematical Analysis, by S.C. Malik and Savita Arrora. (second edition)
Scope: Chapter 19 complete.
   Unit I: Art. 1, 2, 2.1,2.2,2.3 (Theorem 1 only), 2.4,2.5,2.6,2.7(Definitions with
      illustrations and statements of theorems only).
   Unit II: Art. 3, 4 (Theorem 16 statement only)
   Unit III: Art 5 (Theorems 21statement), 5.1,5.2(Definitions with examples and
      statements of theorems 26 to 33 only)
      Art 6. (up to theorem 38 and example 46 on connectedness).

References:
   1) Real Analysis, by Somasundaram & Chaudhary.
   2) Methods of Real Analysis, by R.Goldberg.Oxford & IBH Pub. Co.PVT   Ltd
   3) Elements of Real Analysis, By Shantinarayan & M.D. Raisinghania, (S. Chand.
     Co. Ltd)
   4) Metric Spaces, by E. T. Copson, Cambridge University Press. Universal Book
      Co. New Delhi.
   5) Lecturers on analysis, by T. M. Karade , Sonu Nilu Pub Nagpur .
   6) Mathematical Analysis, by T. M. Apostol, Narosa Pub. House New Delhi.

B.A/B.Sc. T.Y. Semester-V
Paper XIV (MT 302): Linear Algebra.
Effective from June -2015

(No. of periods: 60 Max.Marks:40+10=50)

Unit I: Vector spaces: Elementary basic concepts of vector spaces, Linear independence and bases, Dual spaces.

Unit II: Inner product spaces, Fields: Extension fields (definitions only).

Unit III: Linear transformation: The algebra of linear transformations, Characteristic roots, Matrices.

Text Book: Topics in Algebra, by I.N. Herstein (2ⁿᵈ Edn.) John Wiley and Sons.

Scope: Unit I: Chap. 4: Art. 4.1,4.2,4.3
        Unit II: Chap. 4: Art. 4.4,
           Chap. 5: Art. 5.1.(Definitions only)
        Unit III: Chap. 6: Art. 6.1, 6.2 .6.3.

References:
1) A First course in Abstract Algebra ,by John B. Fraleign.
2) Contemporary Abstract Algebra ,by Joseph A. Gallian.
3) Linear Algebra for under graduates, by S.R. Mangalgiri and D.K. Daftari.
4) First Course in Linear Algebra, by P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul.
5) An Introduction to linear Algebra ,by V Krishnamurty , V P mainru, J.L. Arrora.
6) Linear Algebra, by L Smith, Springer-Verlag New York.
7) Matrix and Linear Algebra, by K b Datta, Prentic Hall of India Pvt. Ltd New Delhi, 2000.

Choose either XV (A) or XV (B) from the following papers.
B.A/B.Sc. T.Y. Semester-V
Paper XV (A) (MT 303A): Operation Research
(No. of periods: 60 Max. Marks:40+10=50)
Effective from June -2015

Unit I: Linear programming (Mathematical formulation), Linear programming (Graphical), Graphical solution method, General linear programming problem, Canonical and standard forms of L.P.P, Simplex method.

Unit II: Linear programming (simplex method), Fundamental properties of solution, Computational procedure, Use of Artificial Variables, Degeneracy in Linear Programming, Solution of simultaneous linear equations, Inverting a matrix.

Unit III: Mathematical formulation of the problem, the assignment method, special cases, typical assignment problem, Traveling Salesman problem.

Text Book:
   Operation Research, By Kanti Swarup, P.K. Gupta and Man Mohan. (Reprint 2005),   S. Chand & Co.
Scope:
        Unit I: Chapter-2: Articles 2.1, 2.2.
                    Chapt. 3: Art. 3.1 to 3.6.(Complete).
        Unit II: Chapter-4: Articles 4.1 to 4.7.(Complete).
        Unit III: Chapter-11: Articles 11.1 to 11.7.

References:
  (1) Introduction to Operation Research ,by Hiller and Lieberman.Tata Mc Graw Hill.
  (2) Operation Research an Introduction, by Hamdy A. Taha Pearson Pub.
  (3) Linear Programming Methods and applications), by Gass E. , Narosa Publishing
      House New Delhi .
  (4) Operation Research, by R K Gupta , Krishana Prakashan Media Ltd
  (5) Operation Research ,by Sharma S D , K Ramnath and Co. Meerut
  (6) Linear Programming ,by Manju Sharma , Ramprasad and Sons Agra -3
  (7) Operation Research (Theory and applications , Second Edition 2006),
      by J K Sharma, Macmilan India Ltd .

B.A/B.Sc. T.Y. Semester-V
Paper XV (B) (MT 303B): Mechanics-I
(Statics)
(No. of periods: 60 Max.Marks40+10=50)
Effective from June -2015

Unit I: (Forces Acting on a particle)
   Definitions, Law of parallelogram of forces, Determination of magnitude and direction, Resultant of forces, Components and resolved parts,The Algebric Sum of the resolved parts of two forces , To find magnitude and direction, Resultant of parallel forces.

Unit II: (Equilibrium of Forces acting on a particle)
 Triangle Law of forces, Converse of triangle law of forces, Polygon of forces Lami's Theorem, Conditions of equilibrium of forces acting on a particle.

Unit III (Forces acting on a rigid body)
Introduction, Moment of force, The sum of vector moment of a system of forces, The Sum of the vector moments of two like parallel forces acting on a rigid body, Couples, Two couples acting in one plane upon a rigid body, Equivalent couples, The vector of the resultant couple of two couples, A System of forces acting upon a rigid body, Conditions of equilibrium of forces acting on a rigid body and Cartesian form, Conditions of equilibrium of coplanar forces acting on a rigid body.

Text Book: Mechanics and Differential Geometry ,by V. Tulsani, Warhekar, N.N. Saste. (S. Chand and Co.).

Scope: Unit I**:** Chapter 1: Art. 1.1 to 1.17.
          Unit II: Chapter 2: Art. 2.1 to 2.5.
          Unit III: Chapter 3: Art. 3.1 to 3.12.

References:
(1) Mechanics, by B.R. Thakur and G.P. Shrivastav.
(2) Mechanics, by Shanti Narayan, S. Chand and Co.

SEMESTER –VI.

Note: (1) Papers XVI (MT 304) and XVII (MT 305) are compulsory.
(2) Choose either XVIII (A) or XVIII (B) from the following papers**.**
B.A/B.Sc. T.Y. Semester-VI
Paper XVI (MT 304): Numerical Analysis.
(No. of periods: 60 Max.Marks:40+10= 50)
Effective from June -2015

Unit I: (**Differences, Operators, Interpolation with equal intervals)**
Introduction, Differences, Theorem, Factorial notation, The operator E, Properties of E and Δ , the operators D and ∇, Interpolation, Extrapolation, Interpolation with equal intervals, Newton- Gregory formula for forward and backward interpolation, Equidistant terms with one or more missing terms. Interpolation for unequal intervals of the arguments, Divided differences with unequal intervals, Divided differences, When two or more arguments are same, Properties of divided differences (Theorems 1, 2 only)

Unit II: Properties of divided differences(Theorems 3, 4 only), Newton's, Formula for unequal intervals, Lagrange's, Formula for unequal intervals, Central differences ($\nabla, \delta, \sigma, \mu$), Interpolation formulae: Gauss, Bessel and Stirling's.

Unit III: Numerical differentiation, Introduction, Approximate Expressions for the derivative of a function, Unsymmetrical expressions for third order derivative, Numerical quadrature, Introduction, General quadrature formula, Trapezoidal, Simpson's one-third and three-eight rules. Weddle's rule. Numerical solution of O.D.E., Introduction, equation of first order, Euler"s method, Euler"s modified method, Picard's method, Talyor series method.

Text Book: Finite Differences and Numerical Analysis. By H.C. Saxena.
(S. Chand & Co. reprint 2001).
Scope: Chap. 1: Art. 1.1 to 1.3, 1.5.1,1.5.2,1.5.3, 1.6, 1.6.1, 1.6.2, 1.7 1.7.1, 1.8, 1.8.1, 1.8.2, 1.8.3.
Chap. 2: A rt. 2.1, 2.2, 2.3, 2.4.1.
Chap. 3: 3.1, 3.2, 3.3, 3.4, 3.5.
Chap. 5: Art. 5.1, 5. 2. 5.3.
Chap. 6: Art. 6.1, 6.2, 6.3.1, 6.3.2, 6.3.3, 6.3.4
Chap. 15: Art. 15.1, 15.2.1, 15.2.2, 15.2.3, 15.2.4(a).

References
1. S.S. Satry, "Introductory methods of Numerical Analysis" Prentice-Hall of India Private Ltd.   (Second Edition) 1997.
2. E.V. Krishnamurthi & Sen. "Numerical Algorithm,"Affiliate East. West press. Private Limited 1986
3. M.K. Jain, SRK Iyengar, R.K. Jain, "Numerical methods for Scientific and Engineering computations." New Age International Limited Pub.

Unit –I : Laplace Transforms

Introduction , Laplace Transform, Important Formulae, Properties of Laplace Transforms, Laplace Transforms of the derivative of $f(t)$, Laplace Transforms of derivative of order n , Laplace Transform of integral of $f(t)$, Laplace Transform of $t \bullet f(t)$ (Multiplication by t),

Laplace Transform of $\frac{1}{t} \cdot f(t)$ (Division by t), Unit Step Function. Second Shifting Theorem, Impulse Function, Periodic Functions, Convolution Theorem, Evaluation of integrals, Formulae of Laplace transform, Properties of Laplace Transform.

Unit –II: Inverse Laplace Transforms

Inverse Laplace Transforms, Important formulae ,Multiplication by s, Division by s , First Shifting property, Second Shifting property, Inverse Laplace transform of derivatives, Inverse Laplace Transform of Integrals, Partial fractions Method , Inverse Laplace transform by Convolution, Solution of Differential Equation by Laplace transforms , Solution of Simultaneous Differential Equations by Laplace transforms .

Unit III: Fourier Transforms

Introduction, Integral Transforms, Fourier Integral Theorem, Fourier sine and Cosine Integrals, Fourier Complex Integral, Fourier transforms, Fourier sine and cosine transforms, Properties of Fourier Transforms.

Text Book: Advanced Engineering Mathematics, By H.K. Dass ,S. Chand and Co.
Scope: Unit –I :   13.1 to 13.15,and 13.17 to 13.19
      Unit –II :   13.20 to 13.31
      Unit –III :   14.1 to 14.8

References:

1) Operational mathematics, By R V Charchil , Johan Wiley & Sons New York. 1985.
2) An Introduction to Laplace Transforms and Z- Transforms, By Grove A C Printice Hall 1991.
3) Guide to the Laplace transforms and Applications , By Doetsch G. Springer Ver. 19963.
4) Introduction to Theory and Application of Laplace Transforms , By Doetsch G. Springer Verg. 1990.
5) Complex Analysis, By Alhlfors L.V. Mc- Graw Hill 3rd ed. 1979.

6) Schames Outline of Laplace Transforms By Murray Spigel Schame outline Series Mc-Graw Hill 2012.

7) The Laplace Transforms Theory and Applications Joel. L. Schiff, Springer 2008.

8) Fast Fourier Transforms : Algorithms and Applications By K.R.Rao, D.N. Kim, J.J. Hwang, Springer 2010.

9) Fourier Transform By S. Bochner and K Chandrasekehran , University Press 1949.

10) Fourier and Laplace Transform By R.J. Becrends H.G., Morsche . J.C. Vande Berg and E.M. Vande Vrie, Cambridge Press 2003.

Choose either XVIII (A) or XVIII (B) from the following papers.
B.A/B.Sc. T.Y. Semester-VI
Paper XVIII (A) (MT 306A): Topology
(No. of periods: 60 Max.Marks:40+10=50)
Effective from June -2015

Unit I: Fundamental concepts, Functions, Relations, The integers and the real numbers, Cartesian product , Finite Sets, Well-ordering theorem, Topological spaces, Basis for topology.

Unit II: The Ordered topology, The product topology, The subspace topology.

Unit III: Closed sets and limit points, Closure and interior of a set, Limit points, Continuity of a function, Definitions of product topology, Connected and compact spaces (definitions only).

Text Book: Topology A First Course, By James R. Munkres. Prentice Hall of India.

Scope: Unit I: Chap. 1: Art. 1.1 to 1.6, Art. 1.7 (statements of theorems), Art. 1.10
        Chap. 2: Art. 2.1, 2.2.
    Unit II: Chap. 2: Art. 2.3, 2.4, 2.5.
    Unit III: Chap. 2: Art. 2.6, 2.7, 2.8 (definitions).
        Chap. 3: Art. 3.1(theorems without proof 1.5, 1.6), 3.5 (definitions and examples).

References:
1. John Horvath, Topological Vector Spaces & Distribution, Addison-Wesely Publishing Company 1966.
2. F. Treves, Topological Vector spaces, Distribution, Kernel,Academic Press, Inc., New York, 1967.
3. G. Kothe, Topological Vector spaces, Vol.1, Springer, New York, 1969.
4. R. Larsen, Functional Analysis, Marcel Dekker, Inc., New York, 1973.
5. Walter Rudein, Functional Analysis, TMH edition, 1974.

B.A/B.Sc. T.Y. Semester-VI
Paper XVIII (B) (MT 306B): Mechanics-II
Effective from June -2015 (Dynamics)

(No. of periods: 60 Max.Marks:40+10=50)
Unit I: (Kinematics and Dynamics of a particle in two dimensions)
 Introduction, Definitions, Expressions for velocity and acceleration, Components
of velocity and acceleration, Tangent and unit vector, Rate of change of a unit vector
moving in a plane, Curvature and principal normal, Tangential and normal components
of velocity and acceleration, Angular speed and angular velocity, Angular acceleration,
The radial and transverses directions, Find the radial and transverse components of
velocity and accelerations .
Unit II: (Kinetics of a Particle)
 Introduction, Newton's law of motion, Matter, Linear momentum, Impulsive force
and its impulse, Unit of impulse, Conservation of linear momentum, Impact of two
bodies, Work, Work done by a force, Unit of work, Power, Energy, Kinetic energy,
Potential Energy Kinetic energy of particle of mass m moving with velocity, Definition of
scalar and vector point function, Scalar and vector field, Field of force, Conservative
field of force , Potential function.
Unit III : (Motion of a Projectile and motion in resisting medium)
Rectilinear motion, Motion under gravity, Projectile, Range on inclined plane projectile
to pass through a given point (h, k), The relation $t_1.t_2 = \dfrac{2R}{g}$.

Text Book: Mechanics and Differential Geometry, By V. Tulsani, Warhekar, N.N. Saste
(S. Chand and Co.)

Scope: Unit I**:** Chap. 1: Art. 1.01 to 1.13.
Unit II: Chap. 2: Art. 2.01 to 2.25.
Unit III: Chap. 3: Art. 3.01 to 3.10 and 3.13, 3.14.

References:
(1) Mechanics, By B.R. Thakur and G.P. Shrivastav.
(2) Mechanics, By Shanti Narayan, S. Chand and Co.
(3) A text Book of Dynamics by J. N. Kapoor and J. D. Gupta , 5th Ed, Ramchand and
    Co. Delhi
(4) A Text Book of Dynamics by M ray, S Chand &Co.

Paper XIX (MP 307): Practical Paper.(Annual pattern)
(**B.Sc. T.Y. SEMESTER –V & VI**)
(No. of periods 3 per Batch, per week, Max.Marks:100)
Effective from June -2015
PRACTICALS USING MATHEMATICAL SOFTWARES.

(Practical paper is only for **B.Sc**. students)

SECTION A: Solving problems in Algebra
SECTION B: Solving problems on Laplace Transform .
SECTION C: Solving problems in Numerical Analysis.
SECTION D: Solving problems in Mechanics/ Topology and Operation
                Research .

NOTE:- 1) No. of periods per week :**03**.per Batch of 20 students
          2) Examination pattern: **Yearly**
          3) Softwares: **Freeware, MATLAB**.etc.
          4) Minimum **20** practicals should be covered in Record book.

Paper pattern for B. A. / B. Sc. Second Year Mathematics

(For Semester III and IV Theory Pattern)

Faculty: of Arts / Science

Class: B.A./ B. Sc. Second year

Time ;-2.30Hrs   Marks 40

Q1 : Multiple Choice Questions (10 compulsory questions)   1 Mark Each

i) To (x)

ii)

iii)

iv)

v)

vi) ,vii),viii) ,ix), x)

Q2 Attempt any **Two** of the following (**5**- Each)

a) Theory

b) Theory/problem

c) Problem

Q3 Attempt any **Two** of the following (**5**- Each)

a) Theory

b) Theory/problem

c) Problem

Q4 Attempt any **Two** of the following (**5**- Each)

a) Theory

b) Theory/problem

c) Problem