Swami Ramanand Teerth Marathwada University, Nanded.

B. Sc. Third Year (Mathematics)

Syllabus

CBCS Pattern

Effective from June-2018

Scheme of B. Sc. Mathematics Programme (Science Faculty) Under CBCS pattern

Semester	Courses Opted	Course Name	Credits
I	Core Course Section A	Paper-I: Differential Calculus	02
	Core Course Section B	Paper-II: Algebra and Trigonometry	02
	Core Course Practical	Practical Based on Mathematical Software	02
	Total Semester-I		**06**
II	Core Course Section A	Paper-III: Integral Calculus	02
	Core Course Section B	Paper-IV: Geometry	02
	Core Course Practical	Paper-V: Practical Based on Mathematical Software	02
	Total Semester-II		**06**
	Total Semester-I & II		**12**
III	Core Course Section A	Paper-VI: Real Analysis-I	02
	Core Course Section B	Paper-VII: Group Theory	02
	Core Course Section C	Paper-VIII: Ordinary Differential Equations	02
	Skill Enhancement Course	SEC-I: Choose any one	02
	Total Semester-III		**08**
IV	Core Course Section A	Paper-IX: Real Analysis-II	02
	Core Course Section B	Paper-X: Ring Theory	02
	Core Course Section C	Paper-XI: Partial Differential Equations	02
	Skill Enhancement Course	SEC-II: Choose any one	02
	Total Semester-IV		**08**
	Total Semester-III & IV		**16**
V	Discipline Specific Elective Course Section A	Paper-XII: Metric Spaces	02
	Discipline Specific Elective Course Section B	Paper-XIII: Linear Algebra	02
	Discipline Specific Elective Course Section C	Paper-XIV: Choose any one A) Operation Research B) Mechanics-I C) Complex Analysis	02
	Skill Enhancement Course	SEC-III: Choose any one	02
	Total Semester-V		**08**
VI	Discipline Specific Elective Course Section A	Paper-XV: Numerical Analysis	02
	Discipline Specific Elective Course Section B	Paper-XVI: Integral Transforms	02
	Discipline Specific Elective Course Section C	Paper-XVII: Choose any one A) Topology B) Mechanics-II C) Elementary Number theory	02
	Skill Enhancement Course	SEC-IV: Choose any one	02
	Total Semester-VI		**08**
	Total Semester-V & VI		**16**
	Total Course Credits		**44**

Detailed Structure of B. Sc. Mathematics (Faculty of Science) Syllabus under CBCS Pattern

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

CBCS PATTERN FOR B.Sc. MATHEMATICS

B. Sc I Year

Effective From 2016-17

Semester	Section and Paper Code	Period per week	Paper No. and Title of the papers	Marks of Semester	Internal C.A.	Total Marks	Credits
I	CCM-1 Section A	4	Paper- I Differential Calculus	40	10	50	2
	CCM-1 Section B	4	Paper-II Algebra & Trigonometry	40	10	50	2
II	CCM-2 Section A	4	Paper –III Integral Calculus	40	10	50	2
	CCM-2 Section B	4	Paper- IV Geometry	40	10	50	2
	CCMP-I	2	Paper -V Practical on MATLAB	80	20 (R.B.=10 I.E.=10)	100	4
Total Credits							12

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

CBCS PATTERN FOR B.Sc. MATHEMATICS

B. Sc II Year

Effective From 2017-18

Semester	Section And Paper Code	Period per week	Paper No. and Title of the papers	External Marks	Internal C.A.	Total Marks	Credits
III	CCM-3 Section A	5	Paper –VI Real Analysis -I	40	10	50	2
	CCM-3 Section B	5	Paper – VII Group Theory	40	10	50	2
	CCM-3 Section C	5	Paper –VIII Ordinary Differential Equations	40	10	50	2
	SECM-I	3 Theory-1, Practical-2	one Skill can be chosen	25	25	50	2
IV	CCM-4 Section A	5	Paper-IX Real Analysis–II	40	10	50	2
	CCM-4 Section B	5	Paper –X Ring Theory	40	10	50	2
	CCM-4 Section C	5	Paper XI Partial Differential Equation	40	10	50	2
	SECM-II	3 Theory-1, Practical-2	one Skill can be chosen	25	25	50	2
				Total Credits			16

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

CBCS PATTERN FOR B.Sc. MATHEMATICS

B. Sc III Year

Effective From 2018-19

Semester	Section Paper-Code	Period /Week	Title Of The Paper	External Exam	Internal Exam	Total Marks	Credits
V	DSEM-5 Section-A	5	Paper-XII Metric Space	40	10	50	2
	DSEM-5 Section-B	5	Paper-XIII Linear Algebra	40	10	50	2
	DSEM-5 Section-C	5	Choose Any One Of The Following Paper-XIV (A) Operations Research (B) Mechanics-I (C) Complex Analysis	40	10	50	2
	SECM-III	3	Choose Any One Of the Skill	25	25	50	2
VI	DSEM-6 Section-A	5	Paper-XV Numerical Analysis	40	10	50	2
	DSEM-6 Section-B	5	Paper-XVI Integral Transformation	40	10	50	2
	DSEM-6 Section-C	5	Choose Any One Of The Following Paper-XVII (A) Topology (B) Mechanics-II (C) Elementary Number Theory	40	10	50	2
	SECM-IV	3	Choose Any One Of the Skill	25	25	50	2
Total Credit							16

Swami Ramanand Teerth Marathwada University, Nanded.

B. Sc. Third Year Syllabus (Mathematics)

CBCS Effective from June 2018

Outlining the salient features:

1) Utility of Syllabus:

i) Students can verify the convergence of sequences, completeness compactness and connectedness of given metric spaces.

ii) Students will be able to find dimensions of various vector spaces and by using determinant concept students can solve the linear equations in two, three unknowns.

iii) Students can obtain the solutions of LPP using various methods.

iv) Students can obtain equilibrium of forces and resultant force of forces.

v) Students will be able to check the Analyticity of functions

vi) Students can obtain Numerical solutions of differential equations by using numerical techniques.

vii) Students can solve differential equations using Laplace transformations.

2) Learning Objectives of Syllabus:

i) To maintain updated curriculum.

ii) To take care of fast paced development in the knowledge of mathematics.

iii) To meet the needs and requirements of the society and to enhance the quality and standards of Mathematics Education.

iv) To provide multidisciplinary profile and to allow a flexible cafeteria like approach including initiating new papers to cater to frontier developments in the subject like Mathematics.

v) To create confidence in others, for equipping themselves with that part of Mathematics which is needed for various branches of Sciences or Humanities in which they have aptitude for higher studies and original work.

vi) Strengthening the understanding of the students and substantiating the conceptual framework of Mathematics for furthering their potential and capabilities in the subject.

vii) Introducing advanced theories in the subject in an orderly manner with a clearly defined path of interdependence.

viii) Introducing the specializations in different areas of Mathematics and at the same time emphasizing the underlying interconnections in different branches of Mathematics.

ix) Generating more interest in the subject and motivating students for self learning beyond the realm of syllabi and examinations.

x) Inculcating the spirit of inquiry among the students and preparing them to take up the research in Mathematics.

xi) Exhibiting the wide range of applications of Mathematics and preparing students to apply their knowledge in diverse

3. Prerequisite:

Basic Set theory, Convergence of sequence and series, Basic Group theory and Ring theory, Fields, Linear equations, Vectors and Scalars, Number System, Differentiation and Integration.

B.Sc. T.Y. Semester-V
DSEM-5, Section-A
Paper XII: Metric Spaces

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

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Unit I: **Definitions and examples**:
Definition of Metric Space, Examples of Metric Space, Diameter of a nonempty Set.
Open and Closed sets:
Open and Closed Spheres, Neighbourhood of a Point, Open Sets, Limit Points, Closed Sets, Subspaces, Closure of a Set.

Unit II: **Convergence and Completeness**:
Definition, Cauchy Sequence, Cantor's Intersection Theorem, Baire's Category Theorem.
Continuity and Uniform Continuity:
Definitions, Examples, Theorems on Continuity and Uniform Continuity, Banach Fixed Point Theorem.

Unit III: **Compactness:**
Definitions and Theorems on Compactness, Heine-Borel Theorem, Compactness and Finite Intersection Property, Relative Compactness, €-Nets and Totally Bounded Sets, Lebesgue Number for Covers.
Connectedness:
Separated Sets, Definition and Theorems on Connectedness.

Text Book: S.C. Malik and Savita Arora, "Mathematical Analysis", New Edge International (P) Limited Publisher, New Delhi (Fourth Edition).

Scope:

Unit I : Chapter 19:- Art. 1, 2, 2.1, 2.2, 2.3 (Theorem 1 only), 2.4, 2.5, 2.6, 2.7.
Unit II : Chapter 19:- Art. 3, 4 (Theorem 16 statement only), 4.1.
Unit III: Chapter 19:- Art. 5 (Theorem 21statement only), 5.1, 5.2(Theorems 26 to 33 Statements only) , Art. 6. (up to Theor em 39 and Example 45).

Reference Books:

1. Somasundaram & Chaudhary "A First Course in Mathematical Analysis", Narosa Pub. House New Delhi.
2. R. Goldberg, "Methods of Real Analysis", Oxford & IBH Pub. Co.PVT Ltd Shantinarayan & M.D. Raisinghania, "Elements of Real Analysis", S. Chand. Co. Ltd.
3. E. T. Copson "Metric Spaces", Cambridge University Press. Universal Book Co. New Delhi.
4. T. M. Apostol "Mathematical Analysis", Narosa Pub. House New Delhi.
5. T. M. Karade, "Lecturers on Analysis", Sonu Nilu Pub. Nagpur.

B.Sc. T.Y. Semester-V
DSEM-5, Section-B
Paper XIII: Linear Algebra.

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

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: I.N. Herstein, "Topics in Algebra", (2^{nd} Edition), 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. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, "First Course in Linear Algebra", New Age International-1983.
2. V. Krishnamurty , P Mainara, J.L. Arrora, "An Introduction to linear Algebra", Affiliated East west Press Pvt. Ltd.
3. Smith, "Linear Algebra", Springer-Verlag, New York.
4. K B Datta, "Matrix and Linear Algebra", Prentice Hall of India Pvt. Ltd New Delhi, 2000.
5. Stephen H. Friedberg, "Elementary Matrix Algebra", Second Edition, Prentice Hall
6. V. K. Khanna, S. K. Bhambri, "A Course in Abstract Algebra", S. Chand Publications.

B.Sc. T.Y. Semester-V
DSEM-5, Section-C
Paper XIV (A): Operation Research

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Linear Programming problem:**
Mathematical Formulation: Introduction, Linear Programming Problem, Mathematical Formulation of the Problem, Illustration on Mathematical Formulation of LPPs.
Graphical Solution and Extension: Introduction, Graphical Solution Method, Some Exceptional Cases, General Linear Programming Problem, Canonical and Standard Forms of L.P.P.

Unit II: **Linear Programming Problem:**
Simplex Method: Introduction, Fundamental Properties of Solution, Computational Procedure, Use of Artificial Variables, Degeneracy in Linear Programming, Solution of Simultaneous Linear Equations, Inverting a Matrix using Simplex Method, Applications of Simplex Method.

Unit III: **Transportation Problem:** Introduction, LP Formulation of Transportation Problem, Existence of Solution in Transportation Problem.
Assignment Problem: Introduction, Mathematical Formulation of the Problem, Solution Methods of Assignment Method, Special cases in Assignment Problem, A typical Assignment Problem.

Text Book: Kanti Swarup, P.K. Gupta and Man Mohan, "Operations Research", Fourteenth Thoroughly Revised Edition, Sultan Chand & Sons. Educational Publishers, New Delhi.

Scope:

Unit I : Chapter-2: Articles 2.1to 2.4 (complete), Chapter- 3: Art. 3.1 to 3.5.
Unit II : Chapter-4: Articles 4.1 to 4.8.(Complete).
Unit III: Chapter-10: Articles 10.1, 10.2, 10.3, Chapter-11: Articles 11.1 to 11.5.

References:

1. Hiller and Lieberman "Introduction to Operation Research", Tata Mc Graw Hill.
2. Hamdy A. Taha "Operation Research an Introduction", Eight Edition Pearson Prentice Hall, Pearson Education Inc.
3. Er. Prem Kumar Gupta, Dr. D. S. Hira "Problems in Operations Research Principles and solutions)", S. Chand & Company, Ram Nagar, New Delhi.
4. R. K. Gupta, "Operation Research", Krishana Prakashan Media Ltd.
5. J. K. Sharma, "Operation Research: Theory and Applications", Second Edn. 2006, Macmilan India Ltd.

B.Sc. T.Y. Semester-V
DSEM-5, Section-C
Paper XIV (B): Mechanics-I (Statics)

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Forces Acting on a Particle:**
Definitions, Law of Parallelogram of Forces, Magnitude and Direction of the Resultant, Deductions, Resultant of Forces, Components and Resolved parts, Algebraic Sum of the Resolved Parts, Magnitude and Direction of the Resultant of any number of Forces, Resultant of Parallel Forces.

Unit II: **Equilibrium of Forces Acting on a Particle:**
Triangle law of Forces, Converse of the 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 a Force, Sum of the Vector Moment of a System of Forces, Sum of the Vector Moments of to like Parallel Forces, Couples, Two Couples acting in one Plane upon a Rigid Body, Equivalent Couples, Vector Moment of the Resultant Couple of two Couples acting upon o Rigid Body, System of Forces acting upon a Rigid Body, Conditions of Equilibrium of Forces, Conditions of Equilibrium of Coplanar Forces.

Text Book: V. Tulsani, T. W. Warhekar, N.N. Saste , "Mechanics and Differential Geometry", S. Chand and Co. (pvt.) Ltd. New Delhi, Second Edition.

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. B.R. Thakur and G.P. Shrivastav, "Mechanics", Ram Prasad and Sons, Agra-3, New Edition, New Delhi.
2. Shanti Narayan, "Mechanics" S. Chand and Co.
3. S. L. Loney, "An elementary Treatise on Dynamics Particle and Rigid Bodies", A.I.T.B.S. Publishers and Distributers 2003, New Delhi.
4. S. L. Loney, "An elementary Treatise on Statics", A.I.T.B.S. Publishers and Distributers 2004, New Delhi.

B.Sc. T.Y. Semester-V
DSEM-5, Section-C
Paper XIV (C): Complex Analysis

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Complex Numbers:** Sum and Products, Basic Algebraic Properties, Further Properties, Vectors and Moduli, Complex Conjugates, Exponential Form, Products and Powers in Exponential Form, Arguments of Products and Quotients, Roots of Complex Numbers, Examples, Regions in the Complex Plane.

Unit II: **Analytic Functions:** Function of Complex Variables, Limits, Theorems on Limits, Limits Involving the Point at Infinity, Continuity, Derivatives, Differentiation Formulae, Cauchy-Riemann Equations, Sufficient Conditions for Differentiability, Polar Coordinates, Analytic Functions, Harmonic Functions.

Unit III: **Elementary Functions:** The Exponential Functions, The Logarithmic Function, Branches and Derivatives of Logarithms, Some Identities Involving Logarithms, Complex Exponents, Trigonometric Functions, Hyperbolic Functions.

Text Book: J. W. Brown and R. V. Churchill, "Complex Variables and Applications", International Students Edition 2009, 7th Edition.

Scope:

Unit I**:** Chapter 1: Art. 1 to 10.
Unit II: Chapter 2: Art. 11, 14 to 25.
Unit III: Chapter 3: Art. 28 to 34.

References:

1. S. Punnusamy, " Complex Analysis", Narosa Publishing House, 2nd Edition.
2. S. Lang, "Complex Analysis", Springer Verlag.
3. A. R. Shastri, "An Introduction to Complex Analysis", MacMillan.

B.Sc. T.Y. Semester-V
SECM-III

No. of periods: 45 **Max. Marks: 50** **Credits: 2**

Choose any one of following skill.

SEC-III (A) **Financial Mathematics**

The measurement of interest: Introduction, The accumulation and amount functions, The effective rate of interest, Simple interest, Compound interest, Present value, The effective rate of discount, Nominal rates of interest and discount, Forces of interest and discount, Varying interest, Summary of results**.**

References:

1. Kellison Stephen G., The Theory of Interest, 3rd Edition. McGraw-Hill International Edition (2009).
2. UK Institute of Actuaries core leading for the subject CT1-Financial Mathematics.
3. Elliott R.J. and Kopp P.E. Mathematics of Financial Markets. Springer.1999

SEC-III (B) **Working with Partial Differential Equations using Mathematical Software like Matlab, Mapple, Scilab and other software**

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References:

1. Getting Started With MATLAB 7 - Rudra Pratap, Oxford University Press, (Indian Eden) www.oup.com
2. Satish Annigeri, "An Introduction to Scilab" December 2009.
3. Sandeep Nagar, "Introduction to Scilab For Engineers and Scientists", APRESS.
4. Introduction to Scilab – Michaël Baudin, Consortium Scilab, 2010
5. The Scilab Consortium. Scilab. http://www.scilab.org.
6. Sylvestre Ledru. Different execution modes of Scilab. http://wiki.scilab.org/Different_execution_modes_of_Scilab.
7. Atlas - automatically tuned linear algebra software. http://math-atlas.sourceforge.net.
8. Cecill and free software. http://www.cecill.info.
9. Intel. Intel math kernel library. http://software.intel.com/en-us/intel-mkl/.
10. Flexdock project. Flexdock project home. https://flexdock.dev.java.net/.

B.Sc. T.Y. Semester-VI
DSEM-6, Section A
Paper XV: Numerical Analysis

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Differences, Operators, Interpolation with Equal Intervals:**
Introduction, Differences, 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 Derivatives.
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's Series Method.

Text Book: H.C. Saxena, "Finite Differences and Numerical Analysis", 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 to 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. Sastry, "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.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-B
Paper XVI: Integral Transforms

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

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, Convolution Theorem, Evaluation of Integrals, Formulae of Laplace Transform, Properties of Laplace Transforms.

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 Fraction Methods, 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, Theorems, Fourier Sine and Cosine Integrals, Fourier Complex Integral, Fourier transforms, Fourier Sine and Cosine Transforms, Properties of Fourier Transforms.

Text Book: H.K. Dass, "Advanced Engineering Mathematics", S. Chand and Co.

Scope:
Unit I : Art. 13.1 to 13.19
Unit II : Art. 13.20 to 13.31
Unit III: Art. 14.1 to 14.8

References:

1. Grove A . C., "An Introduction to Laplace Transforms and Z- Transforms", Prentice Hall 1991.
2. Doetsch G., "Introduction to Theory and Application of Laplace Transforms", Springer Verlag, 1990.
3. Murray Spigel, "Schaum Outline of Laplace Transforms", Schaum Outline Series Mc-Graw Hill 2012.
4. Joel. L. Schiff, "The Laplace Transforms: Theory and Applications", Springer, 2008.
5. Fourier and Laplace Transform By R.J. Becrends H.G., Morsche . J.C. Vande Berg and E.M. Vande Vrie, Cambridge Press 2003.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-C
Paper XVII (A): Topology

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Set Theory and Logic:**
Fundamental Concepts, Functions, Relations, The Integers and the Real Numbers, Cartesian Product, Finite Sets, Well-ordering Theorem,
Topological Spaces and Continuous Functions:
Topological Spaces, Basis for Topology.

Unit II: **Topological Spaces and Continuous Functions:**
The Order Topology, The Product Topology, The Subspace Topology.

Unit III: **Topological Spaces and Continuous Functions:**
Closed Sets and Limit Points, Closure and Interior of a Set, Limit Points, Continuity of a Function, Definitions of Product Topology
Connectedness and Compactness:
Connected and Compact Spaces (Definitions only).

Text Book: R. Munkres, "Topology: A First Course", 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.Sc. T.Y. Semester-VI
DSEM-6, Section-C
Paper XVII (B): Mechanics-II (Dynamics)

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

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 along the Tangent, Curvature and Principal normal, Tangential and Normal Components of Velocity and Acceleration, Angular Speed and Angular Velocity, Angular Acceleration, Radial and Transverse directions, Radial and Transverse Components of Velocity and Acceleration.

Unit II: **Kinetics of a Particle:**
Introduction, Newton's Laws of Motion, Deductions from Newton's Laws of Motion, Matter, Mass, Weight, Linear Momentum, Moment of Momentum or Angular Momentum, Impulsive Force and its Impulse, Conservation of Linear Momentum, Impact of two bodies, Work, Power,Energy, Scalar Point Function and Scalar Field, Vector Point Function 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, Motion of Projectile and Derivation of Equation of its trajectory, Cartesian Equation of the path of Projectile, Vertex and Latus rectum of the Parabola, Velocity of a Particle in terms of its height, Range on an inclined Plane, Projectile to pass through a given Point, Relation $t_1\, t_2 = {}^{2R}/_{g}$.

Text Book: Tulsani, Warhekar, N. N. Saste, Mechanics and Differential Geometry, 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. B.R. Thakur and G.P. Shrivastav, "Mechanics", Ram Prasad and Sons, Agra-3, New Edition, New Delhi.
2. Shanti Narayan, "Mechanics" S. Chand and Co.
3. S. L. Loney, "An elementary Treatise on Statics", A.I.T.B.S. Publishers and Distributers 2004, New Delhi.
4. J. N. Kapoor and J. D. Gupta , "A text Book of Dynamics", 5th Ed, Ramchand and Co. Delhi
5. M Ray, "A Text Book of Dynamics", S. Chand & Co.

B.Sc. T.Y. Semester-VI
DSEM-6, Section-C
Paper XVII (C): Elementary Number Theory

No. of periods: 60 **Max. Marks: 50** **Credits: 2**

Unit I: **Preliminaries**: Mathematical Induction, The Binomial Theorem, **Divisibility Theory in Integers**: Division Algorithm, Greatest Common Divisor, Euclidian Algorithm, Diophantine Equation.

Unit II: **Primes and Their Distribution**: The Fundamental Theorem of Arithmetic, The Sieve of Eratosthenes, The Goldbach Conjecture.

Unit III: **The Theory of Congruences**: Basic Properties of Congruence, Binary and Decimal Representations of Integers, Linear Congruences, The Chinese Reminder Theorem.

Text Book: David M. Burton, "Elementary Number Theory", McGraw- Hill Education (India), Private Limited, 7th Edition.

Scope:

Unit I **:** Chap. 1: Art. 1.1, 1.2.
Chap. 2: Art. 2.2 to 2.5.
Unit II : Chap. 3: Art. 3.1 to 3.3.
Unit III: Chap. 4: Art. 4.2 to 4.4.

References:

1. A. Baker, "A Concise Introduction to the Theory of Numbers", Cambridge University Press, 1984.
2. J. P. Serre, "A Course in Arithmetic- GTM Vol.7", Springer Verlag, 1973.
3. Tom M. Apstol, "Introduction to Analytic Number Theory", Norosa Publishing House, 1980.
4. I. Niven and Zuckerman, "An Introduction to the Theory of Numbers", Wiley, New York, 4th Edition, 1980.
5. Rosen K.H., " Elementary Number theory and its Applications", Pearson Addition Wesely, 5th Edition.

B.Sc. T.Y. Semester-VI
SECM-IV

No. of periods: 45 **Max. Marks: 50** **Credits: 2**

Choose any one of following skill.

SECM-IV (A) **Insurance Mathematics:**

Basic annuities: Introduction, Annuity-immediate, Annuity-due, Annuity values on any date, Perpetuities, Unknown time, Unknown rate of interest, Varying interest, Annuities not involving compound interest.

References:

1. Kellison Stephen G., The Theory of Interest, 3rd Edition. McGraw-Hill International Edition (2009).
2. UK Institute of Actuaries core leading for the subject CT1-Financial Mathematics.
3. Elliott R.J. and Kopp P.E. Mathematics of Financial Markets. Springer.1999

SECM-IV(B) **Solving problems in Numerical Analysis using Mathematical Software like Matlab, Mapple, Scilab and other software**

References:

1. Getting Started With MATLAB 7 - Rudra Pratap, Oxford University Press, (Indian Eden) www.oup.com
2. Satish Annigeri, "An Introduction to Scilab" December 2009.
3. Sandeep Nagar, "Introduction to Scilab For Engineers and Scientists", APRESS.
4. Introduction to Scilab – Michaël Baudin, Consortium Scilab, 2010
5. The Scilab Consortium. Scilab. http://www.scilab.org.
6. Sylvestre Ledru. Different execution modes of Scilab. http://wiki.scilab.org/Different_execution_modes_of_Scilab.
7. Atlas - automatically tuned linear algebra software. http://math-atlas.sourceforge.net.
8. Cecill and free software. http://www.cecill.info.
9. Intel. Intel math kernel library. http://software.intel.com/en-us/intel-mkl/.
10. Flexdock project. Flexdock project home. https://flexdock.dev.java.net/.