NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Introduced from June 2015 onwards)

Paper: MT 301 (CBCS)

Linear Algebra

Specific Objectives: To introduce basic notions in Linear Algebra and use the results in developing advanced mathematics.

A brief note: Theorems and proofs are expected to be prepared from Topics in Algebra by Herstein I.N. and Linear Algebra by Hoffman, Kenneth and Kunze R.

UNITS **No. of Lectures**

Unit I. Direct sum of a vector space, Dual Spaces. Annihilator of a subspace, Quotient Spaces. Algebra of Linear transformations. **15 Lectures**

Unit II Adjoint of a linear transformation, Inner product spaces, Eigen values and eigenvectors of a linear transformation. Diagonalization. Invariant subspaces. **15 Lectures**

Unit III Canonical forms, Similarity of linear transformations, Reduction to triangular forms, Nilpotent transformations, Primary decomposition theorem, Jordan blocks and Jordan forms, Invariants of linear transformations. **15 Lectures**

Unit IV Hermitian, Self adjoint, Unitary and normal linear transformation, Symmetric bilinear forms, skew symmetric bilinear forms, Group preserving bilinear forms. **15 Lectures**

Recommended Reading: (In MLA/APA Style Sheet Format)

a) Basic Reading:- 1) Herstein I. N. : Topics in Algebra, 2nd Edition, Willey eastern Limited

2) Hoffman, Kenneth and Kunze R: Linear Algebra, Prentice Hill of India Private Limited., 1984.

b) Additional Reading: Sahi and Bist, Linear Algebra, Narosa Publishing House.

c) Reference Books: 1. A. R. Rao and P. Bhimashankaran, Linear Algebra, Hidustan Book Agency

2. Surjit Singh, Linear Algebra, Vikas publishing House (1997)

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Introduced from June 2015 onwards)

Paper: MT 302 (CBCS)

Complex Analysis

UNITS **No. of Lectures**

Unit-I: Power series, Radius of convergence, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Mobius Transformations. **15 Lectures**

Unit-II: Line integral, Power series representation of analytic functions, Zeros of an analytic function, Liouville's Theorem, Fundamental theorem of algebra, Maximum modulus theorem, The index of a closed curve. **15 Lectures**

Unit-III: Cauchy's theorem and integral formula, Morera's Theorem, Counting zeros, Open Mapping theorem, Goursat's Theorem, Classification of singularities, Laurent series development, Casorati–Weierstrass theorem. **15 Lectures**

Unit-IV: Residues, Residue theorem, Evaluation of real integrals, The argument principle, Rouche's theorem, the maximum principle, Schwarz's lemma and its application to characterize conformal maps. **15 Lectures**

Recommended Book:

1) John B. Conway: Functions of One Complex Variable, Narosa Publishing House, 3rd Edition.

Reference Books:

1) S. Ponnusamy, Herb Silverman: Complex Variables with Applications Analysis,

Birkhauser, 2006

2) S.Ponnusamy: Foundations of Complex Analysis, Narosa Publishing House.

3) Lars V. Ahlfors: Complex analysis, McGraw-Hill Book Co., New York, third edition,

1978.

4) Herb Silverman: Complex Analysis

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Introduced from June 2015 onwards)

Paper: MT 303 (CBCS)

Object Oriented Programming with C++

UNITS **No. of Lectures**

Unit-I

Introduction to Object Oriented Paradigms: Basic terminology and features. Skeleton of an Object Oriented Program - Creating and Using Classes and members, constructors, member initialization list, member wise assignment, efficiency considerations. Copy constructor and destructors. **Constant objects** and member functions, **Static** data members and functions, **Friend** Function, friend class , non member functions, this pointer, Dynamic memory allocation, Nested classes, **Composition**, introduction to Namespace.

15 Lectures

Unit-II

Operator overloading and user defined conversions – operator overloading fundamentals ,Restrictions., overloading urinary & binary operators, overloading stream (<< & >>) operators, User defined Conversions. **Inheritance**- defining a class hierarchy, Base class member access, Base and Derived class constructor, Object Slicing, public, private & protected inheritance, multilevel inheritance. Direct base classes & indirect base classes, Multiple inheritance.

15 Lectures

Unit-III

Virtual functions and Polymorphism- early and late binding, virtual table, virtual pointer, pure virtual functions, virtual base class, virtual inheritance, Run Time Type Identification.

15 Lectures

Unit-IV

Generic Programming- overview, Function templates, Class templates, member templates, Specialization, overview of Standard Template Library. **Exception handling**- keywords, basics of c++ exceptions, catching an exception, re-throwing an exception and stack unwinding.

15 Lectures

Recommended Reading :

a) Basic Reading :-

1.C++ Primer – Lippman

2.C++ How to program – Deitel & Deitel (Pearson Education)

3. A.L.Stevens - " C++ database development"

b) Additional Reading: 1. Mastering C++ - K.R.VenuGopal, Rajkumar, T. RaniShankar.

2. Effective C++ - Scott Meyers (Pearson Education)

c) References :- 1. Object Oriented Programming in C++ - R. Subburaj (Vikas Publication)

2. Rambaugh et.al. - "Object Oriented Modeling and Designing"

3. Grady Booch -"Object Orient Analysis and Design with applications"

4. Bajarne Stroustrup - "The C++ programming language"(Addison Wesley)

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Introduced from June 2015 onwards)

Paper: MT 304 (CBCS)

Database Systems

UNITS **No. of Lectures**

Unit – I

Introduction to DBMS: Concept and architecture of DBMS, Levels of Abstraction in a DBMS, **The Three Great Data Models:** The Relational Data Model, The Network Data Model, The Hierarchical Data Model, Comparison of the Models
Database Design and the E-R Model: **Overview of the design process, E-R Model, E-R diagrams**
15 Lectures

Unit – II

Relational model : **Concept , Relational Algebra and Tuple and Domain Calculus,** constraints,

SQL: Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), Transaction Control (TCL). **15 Lectures**

Unit – III

Relational database design : Functional dependencies , Normal Forms, join and decomposition. **Transactions and Concurrency Control:** Transaction concept, ACID Properties of transaction, transaction state, concurrent execution ,Serializability, Recoverability, Locking , Time stamp ordering , Optimal method of concurrency control, Multiple Granularity of data items. **15 Lectures**

Unit – IV Security & Protection: Role of DBA, File Structure, Table Space Segments, Data Dictionary Management, Memory Structure, Process Structure, Backup and Recovery system. Distributed database.

PL/SQL: Overview, structure of block, Basic Statements, cursor, exception handling, subprograms, database triggers. **15 Lectures**

Text Books/Reference Books:

1. Korth and Silderschutz - "Database systems concepts" (TMH)
2. C.J.Date - "Introduction to database systems" (Narosa)
3. Desai B. - "Introduction to database concepts"(Galgotia)
4. Ulman J.D. - "Principles of database systems" (Galgotia)
5. Oracle installation and user manual
6. Ivan Bayross – SQL and PL/SQL programming (PHI)
7. Database management system - Pearson publication

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Introduced from June 2015 onwards)

Paper: MT 305 (CBCS)

Design and Analysis of Algorithms-I

Specific Objectives: To introduce different algorithm design techniques

A brief note :- (Unit wise equal weightage should be given in question paper) Theorems and proofs are expected to be prepared from the books in Basic Reading

UNITS		**No. of Lectures**
Unit I	Mathematical Foundations-Growth functions, summations, and recurrences-substitution, iteration, and master methods, counting, and probability, amortized analysis.	**15 Lectures**
Unit II	Sorting- sorting in linear time, median, and order statistics. Advanced Data Structures-B-trees, red-black trees, trie tree, hashing, dynamic order statistics, binomial and Fibonacci heap, disjoint sets.	**15 Lectures**
Unit III	Greedy Algorithms-Huffman coding and task scheduling problems. Knapsack problem**,** Travelling Salesman Problem, Minimum cost spanning tree, Shortest path problem	**15 Lectures**
Unit IV	Dynamic Programming-Matrix chain multiplication, longest common subsequence, Travelling Salesman Problem. 0/1 knapsack Problem, All pairs shortest path	**15 Lectures**

(vi)Recommended Reading :

a) Basic Reading :-

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, Prentice Hall of India. Wesley.
2. Manas Ranjan Kabat, Design and analysis of Algorithms, Prentice Hall of India

b) Additional Reading

1. S. Sedgewick, Algorithms, Addision Wesley.
2. S. K .Basu, Design Methods and Analysis of Algorithms, second edition, Prentice Hall of India

c) References :-

1. M. J. Quinn, Designing Efficient Algorithms for parallel Computers.
2. R. L. Rivesl prentice Hall of India.

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester III)
(Introduced from June 2015 onwards)

Paper: MT 306 (CBCS)

Lab Work III

Specific Objectives: Objectives are to apply theory studied in computer based papers in the semester.

The programs related to Object Oriented Programming in C++ and Database Systems.

The programs on numerical analysis.

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester IV)
(Introduced from June 2015 onwards)

Paper: MT 401 (CBCS)

Functional Analysis

UNITS **No. of Lectures**

Unit I Normed linear spaces, Banach spaces, Quotient norm spaces, continuous linear transformations, the Hahn-Banach theorem. Conjugate space and separability, second conjugate space. The natural embedding of the normed linear space in its second conjugate space. **15 Lectures**

Unit II The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform boundedness principle, Definition and examples of a Hilbert space and simple properties, orthogonal sets and complements. **15 Lectures**

Unit III The projection theorem, separable Hilbert spaces. Bessel's inequality The conjugate space, Riesz's theorem, The adjoint of an operator, self adjoint operators, Normal and unitory operators, Projections. **15 Lectures**

Unit IV Finite dimensional spectral theory : Eigen values and eigenvectors of on operator on a Hilbert space. The determinants and spectrum of an operator, The spectral theorem on a finite dimensional Hilbert space. **15 Lectures**

Recommended Books:

1) G. F. Simmons: Topology and Modern Analysis, McGraw Hill (1963)

2) Reference Books:

1. G. Bachman and Narici : Functional Analysis, Academic Press 1964
2. A. E. Taylor : Introduction to Functional analysis, John Wiley and sons (1958)
3. B. V. Limaye : Functioned Analysis, New age international.

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester – IV)
(Introduced from June 2015 onwards)

Paper: MT 402 (CBCS)

Differential Equations

UNITS **No. of Lectures**

Unit – I : Linear Equations with constant coefficients: The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for the Wronskian, The non-homogeneous equations of order two, The homogeneous equations of order n. **15 Lectures**

Unit - II Initial value problems for the nth order equations, The non-homogeneous equation of nth order. Linear Equations with variable coefficients. Initial value problems for the homogeneous equations. Solutions of the homogeneous equations, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The non-homogenous equations. **15 Lectures**

Unit - III Greens function, Sturm Liouville theory, Homogeneous equations with analytic coefficients, The Legendre equations. Linear Equations with regular singular points: The Euler equations, Second order equations with regular singular points. **15 Lectures**

Unit – IV The Bessel equation, Regular singular points at infinity, Existence and uniqueness of solutions: The method of successive approximations, The Lipschitz condition . Convergence of the successive approximation. **15 Lectures**

Recommended Books:

1) E. A. Coddington: An introduction to Ordinary Differential Equations. (1995) Prentice Hall of India Pvt. Ltd. New Delhi.

References Books:

1. E.D. Rainville: Elementary differential equations, The Macmillan company, New Yor (1964).
2. G.F. Simmons: Differential Equations with Applications and Historical note, McGraw Hill, Inc. New York. (1972)

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester IV)
(Introduced from June 2015 onwards)
Paper : MT 403 (CBCS)

Design and Analysis of Algorithms II

UNITS **No. of Lectures**

Unit I: Sorting Networks-Comparison networks, bitonic sort and merge-sort networks. Arithmetic circuits-Combinational circuits, addition, multiplication, and clocked circuits. Parallel Algorithms-CRCW,EREW algorithm, matrix inversion. **15 Lectures**

Unit II : FFT- Polynomial representation, DFT, FFT. Number-Theoretic Algorithms-Modular arithmetic. Chinese remainder theorem, RSA Codes. **15 Lectures**

Unit III: String Matching-Rabin-Karp, KMP, Boyer-Moore algorithms. Geometric Algorithms-Algorithms for finding convex hull. Closet pair of points. Linear programming Problems. **15 Lectures**

Unit IV NP- completeness –P and NP classes, NP-completeness and reducibility, NP completeness proofs. Approximation Algorithms-Vertex cover, traveling salesman, set covering, and subset-sum problems. **15 Lectures**

Recommended Books:

1. T. H. Cormen, C. E. Leiserson, and R. L. Rivest: Introduction to Algorithms, Prentice Hall of India. Wesley.
2. S. Basse, A. V. Gelder: Computer Algorithms, Introduction to Design & Analysis, Addison Wesley.

References Books :

1. M. J. Quinn: Designing Efficient Algorithms for parallel Computers.
2. S. Sedgewick: Algorithms, Addison Wesley.

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester IV)

(Introduced from June 2015 onwards)

Paper: MT 404 (CBCS)

Object Oriented Programming with Java

UNITS **No. of Lectures**

Unit – I Getting Started with Java: The Java Virtual Machine, The Editions of Java, A Simple Java Program. **Java Fundamentals:** Java Keywords, Identifiers, Java's Eight Primitive Data Types. **Control Structures:** Flow of Control, Boolean Logic, Boolean Operators, The if Statements, The if/else Statements, The Switch Statements, The While Loop, The do/While Loop, For Loop, Break Keyword, Nested Loops. **Classes and Objects:** Procedural Programming vs Object Oriented Programming, Object Oriented Analysis and Design, Garbage Collection.

15 Lectures

Unit – II Method: Method Call Stack, Method Signature, Call by Value, Overloading Methods, Constructors, Default Constructor, A Class with Multiple Constructors, Using this in Constructor. **Understanding Inheritance:** The is a Relationship, Single Versus Multiple Inheritance, The Java Lang. Object Class, Method Overriding, The Super Keyword, The Final Keyword, Invoking a Parent Class Constructor. **Advanced Java Language Concepts:** Packages, The Access Specifies, Encapsulation, Understanding Static Members, Accessing Static Fields and Methods, Static Initializes, Instance Initializes. **Polymorphism and Abstraction:** Polymorphism, Casting References, The Instance of Keyword, Heterogeneous Collections, Virtual Methods, Abstraction, Abstract Classes, Abstract Methods. **15 Lectures**

Unit – III Collections: Arrays, The Length Attribute, Multidimensional Arrays, Example of Heterogeneous Collection, Java Collections Framework, The Vector Class, The Hashtable Class. **Interfaces:** User-Defined Interfaces, Implementing an Interfaces, Extending Interfaces, Interfaces and Polymorphism. **Exception Handling:** Flow of Control of Exceptions, Throwable Classes, Methods of Throwable Classes, Catching Exceptions, Writing try/ catch Blocks, Multiple catch Blocks, Handle or Declare Rule, Declaring Exceptions, The throws Keyword, Throwing Exceptions The Finally Keyword, Overridden Methods and Exceptions, User-Defined Exceptions. **15 Lectures**

Unit – IV An Introduction to GUI Programming: AWT Versus Swing, Creating Windows, Containers and Components, Layout Managers, Panels, **GUI Components and Event Handling:** The Delegation Model, The Event Listener Interfaces, Creating an Event Listener, Registering a Listener with an Event Source, The Event Adapter Classes, **Applets:** The java. applet.Applet Class, Swing Applets, Life Cycle of an Applet The appletviewer Tool, Sandbox Security, **Threads:** Life Cycle of Thread, Creating Thread, Implementing Runnable, Extending the Thread, Class, Method of The Thread, Class, Timer and Timer Task Classes, Scheduling Tasks, Multithreading Issues, Synchronized Keyword, Deadlock Issues, Ordering Locks, Wait() and Notify() Methods. **15 Lectures**

Recommended Books:

1) Ricard F. Raposa,: Learning JAVA, Wiely Publishing Inc.

2) V.V. Bhaskar, P. V. Subba Reddy: Object Oriented Programming Through JAVA, Scitech Publications (India) Pvt. LTD.

3) Fundamentals of Core JAVA Volume –I & II

Reference Books:

1. Herbert Schildt: The Complete Reference to JAVA , Fifth Edition

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester IV)

(Introduced from June 2015 onwards)

Paper: MT 405 (CBCS)

Linux Operating System

UNITS **No. of Lectures**

Unit-I: Overview of Operating System Concepts: Kernel Basics, Architecture of Kernel, Files and File System. **Internal Representation of Files:** inodes, directories, superblocks, disk blocks. **System Calls:** open, read, write, close, creation of files, mount and unmount, link and unlink. Processes, Users and Groups, Permissions, Signals, Interprocess Communication. **15 lectures**

Unit-II: Introduction to Linux: History, Open Source Technology, Linux Distributions. **Installation:** System Requirements, Partitions, Boot Loaders, Installation Procedure. **Linux Interfaces:** User Accounts, Display Managers, Command Line Interface. **KDE:** Introduction and Features, the KDE Desktop, KDE Control Center. **Gnome:** The Gnome interface, Gnome Desktop, Window Manager, Panel. **15 lectures**

Unit-III: Editors: commands and working of vim and emacs editor. **File Structure:** files and directories, permissions, utilities. **Shell:** Introduction, types, command line, various built-in shell commands, Shell Expansion and Redirection, input/output, pipes, variables, Shell Scripts.

. **15 lectures**

Unit-IV: Shell Programming: variables, operators, control structures, user input/output, pattern matching/searching, command line arguments. **The gawk scripting language:** syntax, variables, operators, arrays, structured commands. . **15 lectures**

Recommended Books:

1) Maurice J. Bach : “The Design of Unix Operating System”, Prentice Hall India
2) Sumitbha Das: "UNIX concepts and applications", Tata McGraw Hill, New Delhi, 2001, Ninth reprints.

Reference Books:

1) Richard Peterson : “The Complete Reference – Linux, 5th Edition”, Tata Mcgraw Hill.
2) E.Siever, S.Figgins, R.Love and A.Robbins: “Linux in a Nutshell, 6th Edition”, O’Reilly
3) Robert Love: “Linux System Programming, 2nd Edition”, O’Reilly.
4) Richard Blum: “Linux Command Line and Shell Scripting Bible” Wiley Publishing Inc.

NEW/REVISED SYLLABUS FOR

M. Sc. Tech. Mathematics (Part II) (Semester IV)
(Introduced from June 2015 onwards)
Paper: MT 406 (CBCS)

Lab Work IV

Specific Objectives: Objectives are to apply theory studied in computer based papers in the semester.

The programs related to Object Oriented Programming with Java and Linux Operating System.

Old course	New Course
Semester I	
Real Analysis	Real Analysis (Sem. II)
Algebra I	Algebra (Sem. I)
Discrete Mathematical structures I	Discrete Mathematical structures I
Programming in C with ANSI features I	Programming in C (Sem. I)
Lab course	Lab course(Sem. I)
Semester II	
Real and complex Analysis	Complex Analysis(Sem. III)
Algebra II	Linear Algebra(Sem. III)
Discrete Mathematical structures II	Discrete Mathematical structures II
Data Structures in C	Data Structures in C
Programming in C with ANSI features II	Advanced Calculus
Lab course	Lab course (Sem. II)
Semester III	
Differential Equations	Differential Equations(Sem. IV)
Database Systems	Database Systems (Sem.III)
Object Oriented Programming in C++	Object Oriented Programming in C++(Sem.III)
Operating System-I	Operating System-I (Sem.II)
Design and Analysis of Algorithms-I	Design and Analysis of Algorithms-I (Sem.III)
Lab course (Sem.III)	Lab course (Sem.III)
Semester IV	
Functional Analysis	Functional Analysis (Sem. IV)
Operations Research	Operations Research (Sem.II Part I)
Object Oriented Programming with JAVA	Object Oriented Programming with JAVA(Sem .IV)
Operating System II	Linux Operating System (Sem.IV)
Design and Analysis of Algorithms-II	Design and Analysis of Algorithms-II (Sem.IV)
Lab course (Sem. IV)	Lab course(Sem. IV)