Programme: B. Sc Mathematics

Course Title	Course Code	Equivalent Code
Mathematics for Competetive Examinations (Candidates admitted from 2014 Onwards) Mathematics for Competetive Examinations Mathematics for Civil Service Examinations Mathematics for Civil Service Examinations	**U14MA1S1** U12MA1S1 U11MA1S1 U08MA1S1	**U14MA1S1**
Algebra, Trigonometry and Differential Calculus (Candidates admitted from 2014 Onwards) Algebra, Trigonometry and Differential Calculus Algebra and Trigonometry and Differential Calculus	**U14MA101** U11MA101 U08MA101	**U14MA101**
Sequences and Series (Candidates admitted from 2014 Onwards) Sequences and Series Sequences and Series	**U14MA303** U11MA303 U08MA303	**U14MA303**
Differential Equations and Laplace Transforms (Candidates admitted from 2014 Onwards) Differential Equations and Laplace Transforms	**U14MA304** U08MA304	**U14MA304**
Mathematical Statistics - I (Candidates admitted from 2014 Onwards) Mathematical Statistics - I	**U14MAS31** U08MAS31	**U14MAS31**
Algebra (Candidates admitted from 2014 Onwards) Modern Algebra Algebra	**U14MA506** U12MA506 U08MA506	**U14MA506**
Real Analysis (Candidates admitted from 2014 Onwards) Real Analysis	**U14MA507** U08MA507	**U14MA507**
Mechanics (Candidates admitted from 2014 Onwards) Mechanics	**U14MA508** U08MA508	**U14MA508**
Numerical Methods (Candidates admitted from 2014 Onwards) Numerical Methods	**U14MA509** U08MA509	**U14MA509**
Operations Research (Candidates admitted from 2014 Onwards) Operations Research	**U14MA5:1** U08MA5:1	**U14MA5:1**

Course Title	Course Code	Equivalent Code
Integral Calculus and Analytical Geometry of Three Dimensions (Candidates admitted from 2014 Onwards)	U14MA202	
Integral Calculus and Analytical Geometry of Three Dimensions	U11MA202	**U14MA202**
Integral Calculus and Analytical Geometry of Three Dimensions	U08MA202	
Vector Calculus (Candidates admitted from 2014 Onwards)	U14MA2:1	**U14MA2:1**
Vector Calculus	U08MA2:1	
Theory of Equations and Fourier Series (Candidates admitted from 2014 Onwards)	U14MA405	**U14MA405**
Theory of Equations and Fourier Series	U08MA405	
Mathematical Statistics - II (Candidates admitted from 2014 Onwards)	U14MAS42	**U14MAS42**
Mathematical Statistics - II	U08MAS42	
Mathematics of Finance	U08MA4S3	**U08MA4S3**
Complex Analysis Complex Analysis	U14MA610 U08MA610	**U14MA610**
Discrete Mathematics Discrete Mathematics	U14MA611 U08MA611	**U14MA611**
Elementary Number Theory Elementary Number Theory	U14MA612 U08MA612	**U14MA612**
Mathematical Modelling Mathematical Modelling	U14MA613 U08MA613	**U14MA613**
Graph theory Graph theory	U14MA6:1 U08MA6:1	**U14MA6:1**

Allied - Physics

Algebra, Calculus and Analytical Geometry of Three Dimensions Algebra, Calculus and Analytical Geometry of Three Dimensions (Candidates admitted from 2014 Onwards) Algebra, Calculus and Analytical Geometry of Three Dimensions	**U16MAY11** U14MAY11 U12MAY11	**U16MAY11**
Algebra, Calculus and Differential Equations	U08MAY11	**U08MAY11**
Vector Calculus and Trigonometry Vector Calculus and Trigonometry (Candidates admitted from 2014 Onwards) Vector Calculus and Trigonometry	U16MAY22 U14MAY22 U12MAY22	**U16MAY22**
Vector Calculus and Analytical Geometry of Three Dimensions	U08MAY22	**U08MAY22**
Differential Equations, Laplace Transforms and Fourier Series Differential Equations, Laplace Transforms and Fourier Series (Candidates admitted from 2014 Onwards) Differential Equations, Trigonometry , Laplace Transforms and Fourier Series	U16MAY23 U14MAY23 U12MAY23	**U16MAY23**
Trigonometry, Laplace Transforms and Fourier Series	U08MAY23	**U08MAY23**

Objectives:
1. To study the characteristic roots of the matrix.
2. To expose trigonometry as a tool in solving problem.
3. To introduce successive differentiation and partial differentiation

Prerequisite: 'A' Level Mathematics

Algebra
Unit I
Characteristic equation – Eigen values and Eigen vectors of the matrix – Cayley-Hamilton theorem.

Trigonometry
Unit II
Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ (n is a positive integer) – derivations and problems - Expansion of $\cos^n \theta$, $\sin^n \theta$ and $\tan^n \theta$ in a series of sines, cosines and tangents of multiples of θ, θ given in radians – Expansion of $\cos \theta$, $\sin \theta$ and $\tan \theta$ in terms of θ - Hyperbolic functions – Relation between the circular and hyperbolic functions.

Differential Calculus
Unit III
Leibnitz formula for the nth derivative of product - Curvature – circle, radius and center of curvature – Cartesian formula for the radius of curvature - The co-ordinates of the center of curvature - Evolute and involute - Radius of curvature (polar co-ordinates).

Unit IV
Meaning of the derivative – Meaning of the sign of the differential coefficient – Related problems – Maxima and Minima – Conditions for maximum and minimum values of f(x) – Related problems.

Unit V
Partial differentiation – Total differential coefficient – Implicit functions – Homogeneous functions – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

Text Books

1. T. K. Manickavasagam Pillay, T. Natarajan and K. S. Ganapathy, Algebra Volume – II,
    S. Viswanathan (Printers & Publishers) Pvt. Ltd., Reprint 2011 (Unit I).
2. S. Narayanan, T. K. Manickavasagam Pillay, Trigonometry, S. Viswanathan (Printers and
    Publishers) Pvt. Ltd., Reprint 2009 (Unit II).
3. S. Narayanan and T. K. Manickavasagam Pillay, Calculus Volume-I, S. Viswanathan
   (Printers & Publishers) Pvt. Ltd. Reprint 2011(Units III, IV and V).

Unit I   Chapter 2   § 16
        Unit   II   Chapter 3§ 1-5 (excluding formation of equations)
                Chapter 4§ 1, 2
    Unit IIIChapter 3   § 2.1, 2.2
                Chapter 10 § 2.1 – 2.6
    Unit IVChapter 4   § 1, 2.1, 2.2
                Chapter 5   § 1.1 – 1.5
        Unit   V   Chapter 8§ 1.3 – 1.7, 4 & 5

Reference(s)

1. S. Arumugam & Others, Trigonometry, New Gamma Publications, 1985 Revised Edition
2. S. Arumugam & A.Thangapandi Issac, Modern Algebra, New Gamma Publications, 2000.
3. S. Sudha, Algebra, Analytical Geometry (2D) and Trigonometry, Emerald Publishers, Chennai, First Edition 1998.
4. K. Viswanathan Naik, Modern Algebra, Emerald Publishers, Chennai, Reprint 1992.
5. P. Duraipandian, Laxmi Duraipandian, Jayamala Paramasivan, Trigonometry, Emerald Publishers, Chennai, Reprint 1999.
6. S. Sudha, Calculus, Emerald Publishers, Chennai, First Edition 1998.
7. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad.

Core course II - Integral Calculus and Analytical Geometry of Three Dimensions

Sem. II   **Code : U14MA202**
No. of hrs. 5   **Credit: 5**

Objectives:

1. To study the properties of definite integrals and methods for solving multiple integrals.
2. To study straight lines and spheres.

Prerequisite: 'A' Level Mathematics

Integral Calculus
Unit I
Integration of the forms
(i) $\int [(px+q) /(ax^2+bx+c)]dx$ (ii) $\int [(px+q) / (\surd (ax^2+bx+c))]dx$
 (iii)$\int [(px+q)\surd(ax^2+bx+c)]dx$ (iv)$\int dx /(a+bcosx)$ - Properties of definite integrals – Integration by parts.

Unit II
 Reduction formula, Beta and Gamma functions.

Unit III
Multiple integral - Double integral – Change of order of integration – Triple integral.

Analytical Geometry of Three Dimensions
Unit IV
Equation of the straight line – shortest distance between two skew lines – Equation to the line of shortest distance.

Unit V
Sphere – Standard equation – Length of the tangent from any point – Sphere passing through a given circle – Intersection of two spheres – tangent plane.

Text Books
1. S. Narayanan and T. K. Manickavasagam Pillay, Calculus Volume – II,
   S. Viswanathan printers and publishers private limited, Reprint 2011,   (Units I, II& III)

2. T. K. Manickavasagam Pillay and T. Natarajan, A textbook of Analytical geometry
(Part – II – Three dimensions), S. Viswanathan printers and publishers Pvt. Ltd.,
Reprint 2008, (Units IV & V).

      Unit   I   Chapter 1§ 7.3(Rule b, type (ii)), 8 (cases (ii) & (iii)), 9, 11, 12
      Unit II   Chapter 1   § 13.1 – 13.10
                    Chapter 7§ 2.1,2.3,3,4,5
      Unit III   Chapter 5   § 1, 2.1,2.2 (problems only), 3.1,3.2,4

Unit IV   Chapter 3   § 1 - 8
Unit V   Chapter 4

Reference(s)

1. S. Sudha, Calculus, Emerald Publishers, Chennai, First Edition 1998.
2. P. Duraipandian, Laxmi Duraipandian, D. Muhilan, Analytical Geometry 3 Dimensional, Emerald Publishers, Chennai, Reprint 2003.
3. Shanthi Narayanan and Mittal P.K., Analytical Solid Geometry, 16th Edition, S.Chand & Co., New Delhi, 1969
4. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.
5. N. Saran and R. S. Gupta, Analytical Geometry of 3D, Pothishala Pvt. Ltd., Allahabad.

Elective I - Vector Calculus

Sem. II   Code : U14MA2:1
No. of hrs. 5   Credit: 5

Objectives:
1.To introduce physical application of derivatives of vectors.
2.To study the line integral, surface integral and volume integral and their applications.

Prerequisite: U08MA101, U08MA202

Vector Differentiation
Unit I
Limit of a vector function – Continuity of vector functions – Derivative of a vector function – Geometrical significance of vector differentiation – Physical application of derivatives of vectors – Partial derivatives of a vector function – Scalar and vector point functions – Level surface – Gradient of a scalar point function – Directional derivative of a scalar point function – Equation of tangent plane and normal line to level surface.

Unit II
Divergence and curl of a vector point function – Solenoidal vector – Irrotational vector – Vector identities.

Vector Integration
Unit III
Vector integration – Line integral – Application of line integral .

Unit IV
Surface and Volume integrals – Applications - Gauss Divergence theorem
.
Unit V
Stoke's theorem – Green's theorem in plane .

Text Book
P. R. Vittal and V. Malini, Vector Analysis, Margham Publications, Chennai, 2006.
        Unit   I   Chapter 1 - Page 1 - 20
        Unit   II   Chapter 1 - Page 22 - 51
        Unit III   Chapter 2 - Page 54 - 72
        Unit IV   Chapter 2 - Page 75 - 106
        Unit   V   Chapter 2 - Page 108 - 140

Reference(s)
1. T. K. Manickavasagam Pillay and others , Vector Calculus, S. Viswanathan Publications.
2. S. Shanti Narayan, A Text Book of Vector Calculus, S. Chand and Co., New Delhi,1966.
3. K. Viswanatham & S. Selvaraj, Vector Analysis, Emerald Publishers, Chennai, Reprint 1999.
4. P. Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Chennai, Reprint 2003.

For the candidates admitted from the academic year 2014 onwards)
Core Course III - Sequences and Series

Sem. III   **Code : U14MA303**
No. of hrs. 5   **Credit: 5**

Objectives:
 1. To study the binomial, exponential and logarithmic series.
 2. To study the algebra of sequences.
 3. To study the convergence and divergence of series and the methods of testing the convergence.

Prerequisite: 'A' Level Mathematics

Unit I
Infinite Sequences – Bounded Sequences - Convergent, Divergent and   Oscillating Sequences – Properties of convergent and divergent sequences – Monotonic sequences-Behaviour of monotonic sequences.

Unit II
Theorems on limits – Cauchy sequences – Cauchy's general principle of convergence. Infinite Series – Convergence, Divergence and oscillation of a series – General properties of series – Geometric series – Cauchy's general principle of convergence for infinite series.
Comparison test for convergence and divergence of series of positive terms – The k-series-
Application of the comparison tests(simple problems).

Unit III
An important property of convergent series - D'Alembert's ratio test with simple problems. Cauchy's root test - Cauchy's condensation test and their simple problems– Raabe's test – Alternating series –Series of positive & negative terms - Tests for absolute convergence .

Unit IV
Binomial theorem for rational index – Other forms of Binomial expansion – Summation of series – Expansion of rational fractions - Approximate values.Exponential   series- Exponential theorem (statement only)– Summation of series, Expansions and approximations.

Unit V
Logarithmic Series – Calculation of Logarithms - Summation of series, Expansions, Limits and approximations - General Summation of Series.

Text Book

M. K. Venkatraman and Manorama Sridhar, Sequences and Series, The National Publishing Company , 2002.

        Unit I   Chapter 2 § 2.1 – 2.10
        Unit II   Chapter 2 § 2.11, 2.15, 2.16 & Chapter 3 § 3.1 – 3.12
        Unit III Chapter 3 § 3.13 -3.15, 3.17 – 3.20, 3.25 – 3.28
        Unit IV   Chapter 4 § 4.4 - 4.8 & Chapter 5 § 5.1 – 5.7
        Unit V   Chapter 6 § 6.2 – 6.7 & Chapter 7 § 7.1 – 7.7

Reference(s)

1. M. K. Singal and Asha Rani Singal, A first course in Real Analysis , R. Chand & Co., 1984.
2. S. Arumugam, A. Thangapandi Isaac, Sequences and Series, New Gamma Publishing House,1999.
3. T. K. Manicavachagom Pillay , T. Natarajan and K. S Ganapathy, Algebra (Volume 1), S. Viswanathan Pvt.Ltd., 2004.
4. Richard R. Goldberg, Methods of Real Analysis, Oxford and IBH Publishing Co. Pvt. Ltd., 1970.

(For the candidates admitted from the academic year 2014 onwards)

Core Course IV - Differential Equations and Laplace Transforms

Sem. III   **Code :U14MA304**
No. of hrs. 5   **Credit: 4**

Objectives :

1. To study differential equations and partial differential equations of first and second order
2. To study the techniques of finding Laplace transforms and inverse Laplace transforms and real functions and their application in solving ordinary differential equations

Prerequisite: 'A' Level Mathematics

Differential Equations
Unit I
Differential Equations - Linear differential equations with constant co-efficients – The operators D and D^{-1} – Particular Integral – Special methods of finding particular integral – Linear equations with variable co-efficients – To find the particular integral – Special method of evaluating the particular integral when x is of the form x^m.

Unit II
Exact differential equations – conditions of integrability of Mdx + Ndy = 0 – Practical rule for solving an exact differential equation – Rules for finding integrating factors – equations of the first order but of higher degree – Solvable for x, y, dy/dx – Clairaut's form – equations that do not contain x explicitly - Equations that do not contain y explicitly- Equations homogeneous in x & y.

Unit III
Partial differential equations - Derivation of partial differential equations by elimination of constants, arbitrary functions – Different Integrals of P.D.E. – Solutions of P.D.E. in some simple cases- Standard types of first order equations – Standard I, II, III, IV - Equations reducible to the standard forms - Lagrange's equation.

Laplace Transforms
Unit IV
The Laplace Transforms – Sufficient conditions for the existence of the Laplace Transforms – Laplace Transforms of periodic functions – General theorems – Evaluation of certain integrals using Laplace Transforms.

Unit V
The inverse transforms – Inverse transforms of functions – Method of partial fractions – Application of Laplace Transforms to solve ordinary differential equations.

Text Book

S. Narayanan & T. K. Manickavasagam Pillay, Calculus Volume III, S. Viswanathan Pvt. Ltd., 2008

    Unit   I   Chapter   2 § 1, 1.2, 2, 3, 4, 8, 8.1,8.2,8.3
    Unit II   Chapter 1 § 3.1 – 3.3, 4, 5, 5.1 – 5.5, 6.1, 7.1 - 7.3
    Unit III   Chapter 4 § 1, 2, 2.1, 2.2, 3, 4, 5, 5.1 – 5.5, 6
    Unit IV   Chapter 5 § 1, 1.1, 1.2, 2, 3.4, 5
    Unit V   Chapter 5 § 6, 7, 8, 9

Reference(s)

1. P. R. Vittal, Differential Equations and Laplace Transforms, Margham Publications, 2004.
2. S. Sudha, Differential Equations and Integral Transforms, Emerald Publishers, 2003.

Sem. III	**Code : U14MAS31**
No. of hrs. 4	**Credit: 4**

Objectives:

1. To make the students gain wide knowledge in probability which plays a main role in solving real life problems.
2. To frame distribution functions and its types.
3. To study the applications of Binomial and Poisson distributions.

Prerequisite: 'A' Level Mathematics

Unit I
Probability – Mathematical Notion – law of multiplication – Baye's theorem – random variable – distribution function – discrete random variable – continuous random variable.

Unit II
 Joint probability mass function and marginal and conditional probability function – joint probability distribution function – joint density function – marginal density function – independent random variables – The conditional distribution function and conditional probability density function – mathematical expectation – addition and multiplication theorem of expectation – covariance.

Unit III
Expectation of a continuous random variable – conditional expectation and conditional variance – moment generating function – cumulants – characteristic function.

Unit IV
Bernoullidistribution – Binomial distribution – Poisson distribution.

Unit V
Bi-variate distribution, correlation – scatter diagram – Karl pearson coefficient of correlation – calculation of the correlation coefficient for a bivariate frequency distribution – rank correlation – regression – lines of regression.

Text Book
S.C. Gupta , V.K. Kapoor, Elements of Mathematical Statistics, Sultan Chand& sons, Educational publishers, New Delhi, 3 rd edition, Reprint 2008.

Unit I	Chapter 4	§ 4.6, 4.7, 4.8
	Chapter 5	§ 5.1, 5.2, 5.3, 5.4
Unit II	Chapter 5	§ 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.5.5
	Chapter 6	§ 6.1, 6.2, 6.3, 6.4
Unit III	Chapter 6	§ 6.7, 6.8, 6.9, 6.10, 6.11
Unit IV	Chapter 7	§ 7.1, 7.2, 7.3
Unit V	Chapter 10	§ 10.1, 10.2, 10.3, 10.4, 10.6, 10.7, 10.7.1

Reference(s)

1. Mood A. M. Gaybill, F. A. and Bosses, O. C., Introduction to Theory of Statistics, McGraw Hill, 1974.
2. Rahatgi, U. K., An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern, 1984.
3. Surendran and Saxena, Statistical inference, Sultan Chand & Sons.

(For the candidates admitted from the academic year 2014 onwards)

Core Course V - Theory of Equations and Fourier Series

Sem. IV   **Code : U14MA405**
No. of hrs. 5   **Credit: 4**

Objectives:
        1. To learn relation between the roots and coefficients and nature of the roots.
        2. To express periodic functions as a Fourier series.
Prerequisite: 'A' Level Mathematics

Theory of Equations
Unit I
Relations between the roots and coefficients - Symmetric functions of the roots – Sum of the powers of the roots - Newton's theorem.

Unit II
Transformations of equations – Reciprocal equations– Diminishing and increasing the roots –
form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms.

Unit III
Formation of equation whose roots are any power of the roots of a given equation –
Transformation in general – Descartes' rule of signs – Horner's Method.

Fourier series
Unit IV
Definition of Fourier series – Finding Fourier series expansion of a periodic function with period 2π -
Odd and even functions.

Unit V
Half Range Fourier Series - Development in cosine series-development in sine series-Change of interval-Combination of series.

Text Book
 1. T. K. Manickavasagam Pillay, T. Natarajan, K. S. Ganapathy, Algebra Volume I,
S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai, 2011 (Units I, II & III).
2. T. K. Manickavasagam Pillay, S. Narayanan, Calculus Volume III, S. Viswanathan Pvt.
Ltd., 2008 (Units IV & V).
        Unit   I   Chapter 6 § 11 to 14
      Unit II   Chapter 6 § 15 to 19
       Unit III   Chapter 6 § 20,21,24,30
       Unit IV   Chapter 6 § 1 to 3
     Unit V   Chapter 6 § 4 to 7

Reference(s)
1. S. Arumugam, Issac, Trigonometry & Fourier Series 2000
2. Hans Raj Gupta, Theory of Equations.
3. Khanna M. L., Theory of Equations, Jaiprakash, Merrut, 1966.

Sem. IV   **Code :U14MAS42**
No. of hrs. 5   **Credit: 4**

Objectives:
1. To study various continuous distributions and their properties
2. To introduce the concept of statistical inferences

Prerequisite: U08MAS31

Unit I
Rectangular distribution – Normal distribution.

Unit II
Gamma distribution – Beta distribution of first and second kind – exponential distribution – Chi-square variate – derivation of the Chi-square distribution – MGF of Chi-square distribution.

Unit III
Sampling introduction – types of sampling – parameters and statistic – test of significance – null hypothesis – errors in sampling – critical region and level of significance – tests of significance for large sample – sampling of attributes – Statistical hypothesis – simple and composite – steps in solving testing of hypothesis problem.

Unit IV
Applications of Chi-square distribution – Introduction – student's 't' – F-statistic-
ANOVA(one way classification)

Unit V
Introduction – characteristics of estimators – method of estimation – Rao-Cramer inequality.

Text Book
S.C. Gupta , V.K. Kapoor, Elements of Mathematical Statistics, Sultan Chand & Sons, Educational Publishers, New Delhi, 3 rd Edition, Reprint 2008.
          Unit   I   Chapter 8 § 8.1, 8.2
Unit II   Chapter 8 § 8.3 - 8.6
                    Chapter 13 § 13.1 – 13.3
Unit III   Chapter 12 § 12.1 – 12.9
Chapter 16 § 16.2,16.3
Unit IV   Chapter 13 § 13.5
Chapter 14 § 14.1-14.3
Unit V   Chapter 15 § 15.1-15.4

Reference(s)
1. Mood A. M. Graybill, F. A. and Boses, O. C., Introduction to Theory of Statistics, McGraw Hill ,1974.
2. Rahatgi U. K., An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern, 1984.
3. Surendran and Saxena, Statistical Inference, Chand and Sons.

(For the candidates admitted from the academic year 2014 onwards)

Core Course VI –Algebra

Sem. V   **Code : U14MA506**
No. of hrs. 6   **Credit: 5**

Objectives:
     On successful completion of course the students should have concrete knowledge about the abstract concepts like sets, groups, rings and vector Spaces and their properties.

Prerequisite: 'A' Level Mathematics

UNIT-I
  Groups-Subgroups-Cyclic groups-Order of an element-Cosets and Lagrange's Theorem.

Unit-II
  Normal subgroups and Quotient groups -Isomorphism and Homomorphism.

Unit-III
  Rings and Fields-Elementary properties of Rings-Isomorphism-Types of Rings-   Characteristic of a Ring-Subrings-Ideals –Quotient rings –Homomorphism of Rings.

Unit-IV
 Vector Spaces –Subspaces –Linear Transformations-Span of a set-Linear independence.

Unit-V
Basis and Dimensions –Rank and Nullity-Matrix of a Linear Transformation.

Text Book

N.Arumugam and A.Thangapandi Issac, Modern Algebra, Scitech Publishing House -2003. 5th reprint July 2006.

       UNIT-I - Chapter 3 Sections 3.5 to 3.8
       UNIT-II - Chapter 3 Sections 3.9 to 3.11
       UNIT-III- Chapter 4 Sections 4.1 to 4.8 and 4.10
       UNIT-IV- Chapter 5 Sections 5.1 to 5.5
       UNIT-V -Chapter 5 Sections 5.6 to 5.8

Reference(S)

1. M.L.Santiago, Modern Algebra,Tata McGraw Hill,2003
2. R.Balakrishnan and N.Ramabhadran, A text book of Modern Algebra,Vikas,   NewDelhi,2000.
3. Shanthi Narayanan, A text book of Modern Abstract Algebra, S.Chand & Co.,New   Delhi,1972.

Core Course VII – Real Analysis

Sem. V   Code : U14MA507

No. of hrs. 6   Credit: 5

Objectives:

This course is a fundamental one for many courses of any programme in Mathematics.
The objectives are to study
   (i)   the real number system & properties and
   (ii) the properties of various functions defined on the real line.

Prerequisite: U08MA303

Unit I

Real number system – field axioms. Order relations in R. Absolute Value of a real   number and its Properties – Supremum and   infimum of a set. Order Completeness property – countable and uncountable sets.

Unit II

Continuous functions – Limit of functions – Algebra of limits – Continuity of function – Types of discontinues. Elementary properties of continuous functions and Uniform continuity of a function.

Unit III

Differentiability of a function – derivability and continuity – Algebra of derivatives – inverse function's theorem: Darboux's theorem on derivatives.

Unit IV

Rolle's theorem – Mean value theorems on derivatives Taylor's theorem with Remainder. Power series expansion.

Unit V

Riemann Integration – Definition – Darboux's theorem conditions for Integrability – Integrability of continuous and monotonic functions - Integral functions continuity and derivability of integral functions. The first mean value theorem and the fundamental theorem of calculus.

Text Book

1. M.K.Singal & Asha Rani Singal, A first course in Real Analysis, 2008 (Units I, II, III & IV) .
2. Shanthi Narayan, A Course of Mathematical Analysis, 1986.
    Unit   I   Chapter 1 – Section:1-10
Unit II Chapter 5 – Section:1-8
                 Unit III   Chapter 6 – Section:1-5
                 Unit IV   Chapter 7 – Section:1-6
Unit V   Chapter 6

Reference(s)

1. S. L. Gupta and N. R. Gupta, Principles of Real Analysis, Pearson Education Pvt. Ltd.,
   New Delhi, Second Edition 2003.
2. Tom Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.

Core Course VIII – Mechanics

Sem. V   **Code : U14MA508**
No. of hrs. 6   **Credit: 5**

Objectives :
> 1. To provide a basic knowledge about the forces acting at a point, moments and catenary.
> 2. To provide a detailed knowledge about projectiles, simple hormonic motion and central orbit.

Prerequisite: 'A' Level Mathematics

Unit I
Law of parallelogram of forces – Lami's theorem – Resolution of forces

Unit II
Like parallel forces – Unlike parallel forces – Moments – Varigon's theorem of moments – Generalized theorem of moments – Equation to common catenary – Tension at any point – Geometrical properties of common catenary.

Unit III
Projectiles – Path of a projectile – Time of flight – Horizontal range – Motion of a projectile up an inclined plane.

Unit IV
Definition of S.H.M. – Geometrical representation of S.H.M. – Composition of S.H.M. of the same period and in the same line – Composition of S.H.M's of the same period in two perpendicular directions.

Unit V
Radial and transverse components of velocity and acceleration – Differential equation of a central orbit – Given the orbit to find the law of force – Given the law of force to find the orbit.

Text Books
1. M. K. Venkataraman, Statics, Agasthiar Publications, 2007 (Units I & II)
2. M. K. Venkataraman, Dynamics, Agasthiar Publications, 2009 (Units III, IV & V).

> Unit I   Chapter 2   § 1 - 4 & § 9 – 16
> Unit II   Chapter 3   § 1 – 13
> Chapter 11 § 1 – 9
> Unit III   Chapter 6   § 1 – 16
> Unit IV   Chapter 10 § 1 – 7
> Unit V   Chapter 11 § 1 – 13

Reference(s)
1. K. Viswanath Naik, M. S. Kasi, Statics
2. K. Viswanath Naik, M. S. Kasi, Dynamics

Core Course IX –Numerical Methods

Sem. V   **Code : U14MA509**
No. of hrs. 5   **Credit: 4**

Objectives :
1. To introduce different numerical techniques to solve Algebraic and differential equations
2. To develop skills in solving problems using numerical techniques.

Prerequisite: 'A' Level Mathematics

Unit I
Introduction to numerical analysis-The solution of algebraic and transcendental equations – Bisection method – Iteration method – Regular Falsi method, Newton-Raphson method.

Unit II
Solution of simultaneous linear algebraic equations – Direct methods – Gauss elimination method – Gauss-Jordan method – Iterative methods – Jacobi method – Gauss-Seidal method.

Unit III
Finite differences – Differences of a polynomial - Factorial polynomial - Interpolation for equal intervals – Gregory-Newton interpolation formulae – Interpolation with unequal intervals – Lagrange's interpolation formula – Inverse interpolation.

Unit IV
Numerical differentiation and integration – Newton's formulae to compute the derivative – Numerical integration – A general quadrature formula – Trapezoidal rule - Simpson's one third rule – Simpson's three-eighth rule.

Unit V
Numerical solution of ordinary differential equation – Taylor series method – Euler's method – Runge-Kutta methods – Predictor corrector methods.

Text Book
P.Kandasamy, KThilagavathy, K.Gunavathy, Numerical Methods, S.Chand & Company limited, New Delhi, Reprint 2009.
          Unit I Chapter 3 § 3.1, 3.1.1, 3.2, 3.2.1, 3.2.2, 3.3, 3.3.1, 3.4, 3.4.1, 3.4.3, 3.4.4
          Unit IIChapter 4 § 4.1, 4.2, 4.2.1, 4.7, 4.8, 4.9
Unit III Chapter 5 § 5.1, 5.2, 5.3, 5.4,
Chapter 6 § 6.1, 6.2, 6.3,
Chapter 8 § 8.7, 8.8
Unit IV Chapter 9 § 9.1, 9.2, 9.3, 9.7, 9.8, 9.9, 9.10, 9.13, 9.14
Unit VChapter 11 § 11.5, 11.9, 11.12, 11.13, 11.16, 11.17

Reference(s)
1. S. S. Sastry, Introducing methods of Numerical analysis, Prentice Hall of India private
limited, New Delhi, 3rd Edition 2002.
2. M. K. Venkataraman, Numerical methods in Science and Engineering, 2004.

(For the candidates admitted from the academic year 2014 onwards)
Elective Course II - Operations Research

Sem. V   **Code : U14MA5:1**
No. of hrs. 5   **Credit: 5**

Objectives :
1. To introduce the field of operations research which has many applications in management techniques.
2. To help students to find optimum solutions in business and management problems.

Prerequisite: 'A' Level Mathematics

Unit I
Introduction - Origin and development of O.R. – Nature and features of O.R. – Scientific method in O.R. – Methodology of operations research – Applications of O.R. – Opportunities and shortcomings of O. R. – Formulation of L.P.P. graphical solution; general L.P.P., Canonical and standard forms of L.P.P.

Unit II
Simplex methods to solve LPP(Ordinary Simplex method, Big-M-method, Two-phase-Simplex method) Duality in L.P.P.- Introduction, General primal – Dual pair, formulating a dual problem, Dual simplex method.

Unit III
Introduction – General transportation problem (theorems are not included) – the transportation problem – finding an initial basic feasible solution – Degeneracy in transportation problem – MODI method – Some exceptional cases.
Assignment problem : Introduction – Mathematical formulation of the problem – solution methods of assignment problem – special cases in assignment problem.

Unit IV
Introduction – Network and basic components – Logical sequencing – Rules of network construction – Critical path Analysis – Probability consideration in PERT – Distinction between PERT and CPM.

Unit V
Introduction – The inventory decisions – Costs associated with inventories – Factors affecting inventory control – Economic order quantity – Deterministic inventory problems with no shortages – Deterministic inventory problems with shortages – Probabilistic inventory problems.

Text Book
Kanti Swarup, P.K. Gupta , Manmohan, Operations Research, Sultan chand & sons, fourteenth Edition, 2008.
Unit I– Chapter 1 : 1.1-1.4,1.8,1.10,1.11
                  Chapter 2 : 2.1 - 2.4
                  Chapter 3 : 3.1 – 3.5
Unit IIChapter 4 : 4.1,4.3,4.4
                  Chapter 5 : 5.1 – 5.3,5.7,5.9
Unit IIIChapter 10 : 10.1,10.2,10.5,10.9,10.12,10.13,10.15
                  Chapter 11 : 11.1 – 11.4
Unit IVChapter 25 : 25.1 - 25.4,25.6 – 25.8

Unit VChapter 19 : 19.1,19.4,19.6,19.7,19.9,19.10,19.11
Chapter 20 : 20.5 – 20.6

Reference(s)

1. Hamdy M. Taha, Operations Research, Prentice Hall, New Delhi, 2000.
2. S. D. Sharma, Operations Research, 1985.

Core Course X - Complex Analysis

Sem. VI   **Code : U14MA610**
No. of hrs. 6   **Credit: 5**

Objectives:
1. To introduce the theory of complex variable which is different from analysis of real variable.
2. To learn the properties of complex valued function defined on the set of complex numbers.
3. To introduce the concept of complex integration and its properties.

Prerequisite: U08MA507

Unit I
Analytic functions – Continuous functions – Differentiability - Cauchy Riemann equations –Harmonic functions.

Unit II
Bilinear transformations – Cross ratio – Fixed points of a bilinear transformation – Some special bilinear transformations.

Unit III
Complex integration - Definite Integral – Cauchy's theorem – Cauchy's integral formula – Higher derivatives.

Unit IV
Series, Expansions – Taylor's series – Laurent's series – Zeros of an analytic function – Singularities.

Unit V
Calculus of residues – Cauchy residue theorem – Evaluation of definite integrals.

Text Book
S.Arumugam, A.Thangapandi Issac, A.Somasundaram, Complex Analysis, New gamma Publishing House, 5thReprint January2006 .

        Unit   I   Chapter 2 § 2.4 - 2.8
        Unit II   Chapter 3 § 3.1 - 3.5
        Unit IIIChapter 6 § 6.1 - 6.4
        Unit IVChapter 7 § 7.1 - 7.4
        Unit V   Chapter 8 § 8.1 – 8.3

Reference(s)
1. S. Narayanan, T. K. Manickavasagam Pillay, Complex Analysis, S. Viswanathan Printers & Publishers.
2. P. Duraipandian, Laxmi Duraipandian, D. Muhilan , Complex analysis, Emerald Publishers, Revised Edition 2001.
3. Ruel V. Churchill, James Ward Brown , Complex variables and application, McGraw Hill Publishing Company, 5th Edition 1990.

Core Course XI - Discrete Mathematics

Sem. VI   Code : U14MA611

No. of hrs.: 6   Credit: 5

Objective :
        To introduce formal languages and finite state machines which has applications in compiling techniques and complexity theory.

Prerequisite: 'A' Level Mathematics

Unit I
Recurrence relations – Recurrence – An introduction, Polynomials and their Evaluations-Recurrence Relations – Solution of finite order Homogeneous (linear) relations – Solution of Non-homogeneous Relations.

Unit II
Generating functions – Some common Recurrence Relations – Primitive Recursive functions – Recursive and Partial Recursive functions.

Unit III
Lattices – Some properties of Lattices – New Lattices – Modular and distributive Lattices.

Unit IV
Boolean Algebra – Boolean Polynomials – Karnaugh Map.

Unit V
Coding theory – Introduction - Hamming distance - Encoding a message – group codes-procedure for generating group codes - decoding and error correction - an example of a single error correcting code.

Text Book
M. K. Venkatraman., N. Sridharan and N. Chandrasekaran, Discrete Mathematics, The National Publishing Company, September 2007.

        Unit I   Chapter 5 § 1-5
        Unit II   Chapter 5§ 6-9
        Unit III   Chapter 10 § 1-4
        Unit IV   Chapter 10 § 5-7
        Unit V   Chapter 8 § 1- 7

Reference(s)
1.J. P. Trembly and R. Manohar, Discrete Mathematical Structures with Applications to
    Computer Science, McGraw Hill book Company, 1997.
2. J.E. Hop Croft and J.D.Willman, Introduction to Automata Theory, Nicosia Publishing
House, C. L. Liu, Elements of Discrete Mathematics, McGraw-hill Book Company, 1986.
3. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill Book Company, 1986.

(For the candidates admitted from the academic year 2014 onwards)
Core Course XII – Elementary Number Theory

Sem. VI   **Code : U14MA612**
No. of hrs. 6   **Credit: 5**

Objectives:

Prerequisite: 'A' Level Mathematics

Unit I
Absolute value-Divisibility of integers-Division algorithms-Greatest common divisor-Euclidean algorithm-Least common multiple.

Unit II
Prime and Composite numbers-The sieve of Eratosthenes-Euclid's theorem-Unique factorization theorem-positional representation of an integer-Divisors of an integer-Arithmetic functions-product of divisors.

Unit III
Perfect numbers-Euclid's theorem-Abundant, deficient and amicable numbers-Triangular number-Euler function-Greatest integer functions.

Unit IV
Congruences-Residues-Residue classes-complete residue system-Reduced residue system-Magic number-Divisibility tests-linear congruence.

Unit V
Introduction-Fermat's theorem-Euler's Extension of Fermat's theorem-Wilson's theorem-Lagrange's theorem.

Text Book:
S. Kumaravelu and Susheela Kumaravelu , Elements of Number theory, Nagarcoil, January 2002.

       Unit I   Chapter 2   Section 53 - 57
       Chapter 3   Section61 - 76
       Unit IIChapter 4   Section77 - 97
       Unit III   Chapter 4   Section98 - 113
       Unit IV   Chapter 6   Section155 - 188
       Unit V   Chapter 7   Section191 - 211

Reference(s)
1. David M.Burton, Elementary Number Theory.
2. Ivan Niven and H. Zuckerman, An Introduction to Theory of Numbers.

Core Course XIII – Mathematical Modeling

Sem. VI   **Code : U14MA613**
No. of hrs. 6   **Credit: 5**

Objectives
1. To introduce the basic concepts of modeling.
2. To study the different mathematical models involving differential equations, graph theory etc.

Prerequisite: U08MA304

Unit I
Ordinary differential equation – Linear growth model – Growth of science and scientists – Non-linear growth and decay models – Diffusion of glucose or a medicine in the bloodstream.

Unit II
Modeling in population dynamics – Prey-predator models – Competition models – Multi-species models – Modeling of epidemics – Simple epidemic models – A model for diabetic-mellitus.

Unit III
Modeling in second order O.D. E. – Modeling of planetary motion – Motion under central force – Circular motion – Elliptic motion of a satellites – Rectilinear motion.

Unit IV
Modeling through difference equations – Linear difference equation – Obtaining complementary function by use of matrices – Harrod model – cob-web model – Applications of Actuarial science.

Unit V
Modeling through graphs – seven bridge problem – representing results of tournament – Genetic graph – Food web – Communication network – Matrices associated with a directed graph – Detection of clique – Terms of signed graph.

Text Book
J. N. Kapur, Mathematical Modeling , Wiley Eastern Limited, New Age International Pvt. Ltd., Reprint 2013.

      Unit   I Chapter 2 § 2.1 – 2.3 , 2.4.2
  Unit   II Chapter 3 § 3.1.1 – 3.1.3, 3.2.1 & 3.5.1
      Unit III Chapter 4 § 4.1.1 – 4.3.1
      Unit IV Chapter 5 § 5.2.1 – 5.2.6, 5.3.1, 5.3.2 & 5.3.4
      Unit V Chapter 7 § 7.1.2 – 7.3.1

Reference(s)
1. J. N. Kapur, Mathematical Models in Biology and Medicine, New Delhi, 1985.
2. R. Olink, Mathematical Models in Social and Life Sciences, 1978.

Elective -III - Graph Theory

Sem. VI   **Code : U14MA6:1**
No. of hrs. 6   **Credit: 5**

Objectives:
    1.To give introduction to the basic concepts of Graph theory.
    2.To give applications of Graph theory in other disciplines.

Prerequisite: 'A' Level Mathematics

Unit I
Definition of a graph – Finite and infinite graphs – Incidence and Degree - Isolated and pendent vertices – Isomorphism's – Sub-graphs – Walks, paths and circuits – Connected and disconnected graphs – Components – Euler graphs – Operations on graphs – More on Euler's graphs - Hamiltonian paths and circuits.

Unit II
Trees – Properties of trees – Pendent vertices in a tree – Distances and centre in a tree – Rooted and binary trees – Spanning trees – Fundamental circuits – Finding all spanning trees of a graph – Spanning trees in a weighted graph.

Unit III
Cut-sets – Properties of a Cut set – All Cut sets in a graph – Fundamental circuits and Cut-sets – Connectivity and Reparability.

Unit IV
Planar graphs – Kuratowski's two graphs – Representation of a planar graph – Detection of planarity – Geometrical dual – Combinatorial dual.

Unit V
Matrix representation of graphs – Incidence matrix – Circuit matrix – Fundamental circuit matrix and rank of the circuit matrix – Cut-set matrix - Adjacency matrix – Chromatic number – Chromatic partitioning – Chromatic polynomial.

Text Book

Narasing Deo, Graph theory with applications to Engineering and Computer science, Prentice hall of India, New Delhi, Fifteenth printing, 2009.

      Unit I   Chapter 1 § 1.1 – 1.5
               Chapter 2 § 2.1, 2.2, 2.4 - 2.9
      Unit II Chapter 3 § 3.1 – 3.10 (except 3.6)
      Unit III Chapter 4 § 4.1 – 4.5
      Unit IV Chapter 5 § 5.2 – 5.7
      Unit V Chapter 7 § 7.1, 7.3, 7.4, 7.6, 7.9
               Chapter 8 § 8.1, 8.2, 8.3

Reference(s)

1. S. Arumugam, S. Ramachandran, Invitation to Graph Theory, Gamma Publication, Palayamkottai, 1994.
2. F. Harray, Graph Theory, Narosa publishing House, New Delhi.
3. S. A. Choudum, Graph Theory, Macmillan India limited, New Delhi

(For the candidates admitted from the academic year 2014 onwards)

SBEC Course I – Mathematics for Competitive Examinations

Sem. I   **Code : U14MA1S1**
No. of hrs. 2   **Credit: 3**

Objective:

      To develop skills in aptitude and arithmetic.

Unit I
Numbers - HCF & LCM – Decimal Fractions – Simplification.

Unit II
Square roots and Cube roots - Percentage – Average – Ratio and Proportion - Partnership.

Unit III
Profit and Loss - Time and Work- Pipes and Cisterns - Time and Distance

Unit IV
Problems on Trains – Problems on Boats and Streams - Problems on Numbers - Problems on ages.

Unit V
 Simple interest – Compound interest Area - Volume & Surface Areas.

Text Book:

R.S. Aggarwal, Objective Arithmetic S. Chand and Company Ltd., New Delhi, 2003.

Sem. I   **Code : U16MAY11**
No. of .hrs. 5   **Credit : 4**

Objectives:

1.   To introduce the characteristic roots of the matrix.
2.   To introduce several techniques of differentiation and integration of real valued functions.
3.   To introduce the geometry of straight line and sphere.

Unit I
Eigen values and Eigen vectors - Cayley - Hamilton theorem – Diagonalisation of matrices.

Unit II
Leibnitz ' s formula for n^{th} derivative of a product – Curvature and radius of Curvature – Cartesian formula for radius of curvature.

Unit III
Properties of Definite Integrals – Reduction Formulae for $\int e^{ax}x^n dx, \int \sin^n x\, dx, \int \cos^n x\, dx,$ where n is a

positive integer – Evaluation of $\int_0^\infty e^{-ax}x^n dx, \int_0^{\frac{\pi}{2}} \sin^n x\, dx, \int_0^{\frac{\pi}{2}} \cos^n x\, dx,$ where n is a positive integer.

Unit IV
Straight line – equation of a straight line – condition for a straight line to lie on a given plane – condition for coplanarity – shortest distance between two straight lines.

Unit V
Sphere – standard equation – length of the tangent from any point – Equation of a tangent plane – condition for the plane to touch the sphere – intersection of a plane and a sphere – intersection of two spheres – Equation of a sphere passing through a given circle.

Text Books:
1. S. G. Venkatachalapathy, Allied Mathematics (in single volume), Margham Publications, Reprint 2011.(Units I,II, III)

2. S. Narayanan & R.Hanumantha Roa, T.K. Manivasagam Pillay and P.Kandasamy, Ancilliary Mathematics Book Vol.IV, S.Viswanathan Printers and Publishers Pvt.Ltd., 1994. (Unit IV & V)

Unit I   Chapter 6   Pg. 6.10, 6.11
Unit II Chapter 9   Pg. 9.19 – 9.27 , Pg. 9.40 – 9.50
Unit III Chapter 10   Pg. 10.99 – 10.115, Pg. 10.135 – 10.164
Unit IV Chapter 3   Pg. 69 – Pg. 83
Unit V Chapter 4   Pg.84 - Pg.96

Reference(s)

1. T.K. Manichavasagam Pillai, T. Natarajan and K.S. Ganapathy, Algebra (Vol.II),S. Viswanathan Pvt. Ltd, Reprint,2004.
2. S. Narayanan and T.K. Manichavasagam pillay, Calculus (Vol-I, II), S. Viswanathan Printers and Publishers, Reprint,2003.
3. Vittal. P. R, Allied Mathematics, Margham publications, Chennai, Reprint 2000.
4. M.K. Venkataraman, Engineering Mathematics, National Publishing Company, 1999.

Allied Course II – Vector Calculus and Trigonometry

Sem. II	**Code : U16MAY22**
No. of .hrs. 4	**Credit : 4**

Objectives:

1. To introduce the calculus of vectors with physical application.
2. To introduce the expansions of various trigonometric functions in terms of θ and multiples of θ and hyperbolic functions.

Unit I

Scalar and Vector Point Functions - Direction and Magnitude of gradient - Maximum Value of Directional derivative - Divergence and Curl - Definitions (Solenoidal and Irrotational Vectors) - Vector Identities - Formula involving Operator ∇ twice.

Unit II
Vector integration – Line integral – Surface integral – Volume integral

Unit III
Verification of Gauss divergence theorem- Stoke's theorem –Green's theorem (in plane), (No proof is needed)

Trigonometry
Unit IV
Expansions for $sinn\theta$, $cosn\theta$,$tann\theta$ when n is a positive integer- Expansion for $tan(\theta_1 + \theta_2 + \cdots \theta_n)$ –Expansions for $cos^n\theta$ and $sin^n\theta$ in terms of multiples of θ – Expansions of $sin\theta$ and $cos\theta$ in terms of θ - Expansion of $tan\theta$.

Unit V
Euler's formula – Hyperbolic functions- Relations between circular and hyperbolic functions- Inverse hyperbolic functions $nh^{-1}x$, $cosh^{-1}x$, and $tanh^{-1}x$ in terms of logarithmic functions – Separation into real and imaginary parts of
$sin(x + iy)$,$cos(x + iy)$,$tan(x + iy)$,$sinh(x + iy)$,$cosh(x + iy)$,$tanh(x + iy)$and $tan^{-1}(x + iy)$.

Text Book:
S.G. Venkatachalapathy, Allied Mathematics (in single volume), Margham Publications, Chennai, Reprint 2011.

Unit I   Chapter 17 – pg 17.1 - 17.41
Unit II   Chapter 17 – pg 17.41 - 17.70
Unit III Chapter 17 – pg 17.71 - 17.107
Unit IV Chapter 8   – pg 8.1 - 8.26
Unit V   Chapter 8 – pg 8.26 – 8.45

Reference(s)

1. S. Narayanan, T.K. Manichavasagam Pillai, Ancillary Mathematics Vol.III, S. Viswanathan Pvt. Ltd, Reprint 1999.
2. S. Narayanan, T.K. Manichavasagam Pillai, Trigonomety, S. Viswanathan Pvt. Ltd, Reprint 2004.
3. P. Duraipandian, Laxmi Duraipandian and Jayamala Paramasivan, Trigonomety, Emerald Publishers, Reprint 1999.

(For the B.Sc. Physics Candidates admitted from the academic year 2016 onwards)
Allied Course – III Differential Equations, Laplace Transforms and Fourier Series

Sem : II   Code :U16MAY23
No.of hrs: 4   Credit : 4

Objectives :
1. Methods of formation and solving differential equations of dimensions one and higher.
2. Introduction of Laplace transform techniques to solve Ordinary Differential Equations.
3. To impart the application of circular functions through Fourier series.

Unit I

Ordinary Differential Equations – First Order and Higher Degree – Equation solvable for $\dfrac{dy}{dx}$ - Equation solvable for y – Equation solvable for x (simple problems only) – Clairaut 's Form (simple case only).

Unit II
Derivation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions – classification of Integrals – some standard types of First Order Partial Differential Equations – Other standard forms.

Laplace Transforms
Unit III
Definition - Condition for the existence of the Laplace Transforms-Properties of Laplace Transforms - Laplace Transform of some standard functions – Some general theorems.

Unit IV
The Inverse Laplace Transform – Shifting theorem for Inverse Transform – The method of partial fraction can be used to find the Inverse transform of certain functions – Related theorems – Special cases- Applications to solutions of Differential Equations.

Fourier Series
Unit V
Definition – To determine the values of a_0, a_n and b_n – Bernoulli's Formula – Sufficient conditions for representing f(x) by Fourier Series – Even and Odd functions – Properties of Odd and Even functions – Fourier Series of even and odd functions – Half range Fourier Series.

Text Book:

S.G. Venkatachalapathy, Allied Mathematics (in single volume), Margham Publications, Chennai, Reprint 2011.

Unit I   Chapter 13 – pg 13.1 - 13.33
Unit II   Chapter 15 – pg 15.1-15.35
Unit III   Chapter16 – pg 16.1 - 16.22
Unit IV   Chapter16 – pg 16.25 – 16.56
Unit V   Chapter12 – pg 12.1 - 12.42

Reference(s):

1. S. Narayanan, T.K. Manichavasagam Pillai, Calculus Volume III,S. Viswanathan Pvt. Ltd, Reprint 2004.

2. Vittal. P. R, Allied Mathematics, Margham publications, Chennai, Reprint 2000.

Sem. I	**Code : U16MAC11**
No. of hrs. 5	**Credit: 4**

Objectives:
1. To introduce special properties of matrices.
2. To introduce successive differentiation and reduction formulae for integrals.
3. To introduce several techniques of differentiation and integration of real valued functions.

Unit I

Eigen values and Eigen vectors - Cayley-Hamilton Theorem – Diagonalisation of matrices(problems only)

Unit II

Differentiation – Definition - Rules for differentiation – Standard forms – Successive differentiation – n^{th} derivatives – Standard forms – Use of Partial fractions – Applilcation of De-Moivre's theorem – Trigonometrical transformations.

Unit III

Leibnitz's theorem (statement only) on the nth differential co-efficient of the product of two functions of x (problems only) – curvature and radius of curvature – cartesian formula for radius of curvature.

Unit IV

Introduction – Methods of Integration – Integrals of the functions involving $a^2 \pm x^2$ - Integrals of functions of the form $\int f(x)^n \, f'(x)dx$ – Definite Integrals – Properties of definite integrals - Reduction formulae for the three definite integrals :

$$\int_0^{\pi/2} e^{-ax} x^n \, dx, \quad \int_0^{\pi/2} \sin^n x \, dx \text{ and } \int_0^{\pi/2} \cos^n x \, dx \text{ where n is a positive integer. (Problems only)}$$

Unit V

The Gamma and Beta functions – gamma function – recurrence formulae for $\Gamma(n)$ - connection between gamma function and factorials – beta function – relation between beta and gamma functions – applications of beta and gamma functions.

Text Books
1. S.G.Venkatachalapathy, Allied Mathematics (in single volume), Margham Publications, Chennai , Reprint 2011(Units I, III& IV)
2. Dr. M. K. Venkataraman , Dr. Manorama Sridhar, Allied Mathematics Vol-II, Agasthiar Publications first edition, July 2006 (Unit II)

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Unit   I  Chapter  6      6.10 , 6.11
Unit  II  Chapter  1      1.1 , 1.2 , 1.3
          Chapter 2       2.1 - 2.5
Unit III  Chapter  9      pg.no.9.19 – 9.26, 9.40 – 9.50
Unit IV  Chapter  10     pg.no.10.1 – 10.28, 10.99 – 10.115,10.135 – 10.164
Unit  V  Chapter  8      pg.no. 8.2 – 8.29
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Reference(s)

1.T. K. Manichavasagam Pillai, T. Natarajan & K. S. Ganapathy, Algebra (Vol.II) , S.Viswanathan pvt.ltd.Reprint 2004.
2.S. Narayanan and T. K. Manichavasagam Pillai, Calculus (Vol. I, II) Viswanathan Printers and Publishers,Reprint 2003.
3. M. K. Venkataraman, Engineering Mathematics, National Publishing Company,1999.

Sem. II   **Code: U16MAC22**
No. of hrs. 4   **Credit: 4**

Objectives:
     1. To introduce the Calculus of vectors with physical application.
     2. To introduce the expansions of various trigonometric functions in terms of θ and
     multiples of θ and hyperbolic functions.

Unit I
Scalar and vector point functions – Direction and magnitude of gradient – Maximum value of driectional derivative – Divergence and Curl – Definitions (Solenoidal and Irrotational Vectors) – Vector Identities – Formula involving operator ∇ twice.

Unit II
Vector integration – Line integral – Surface integral – Volume integral.

Unit III
Gauss divergence theorem,Stoke's theorem, Green's theorem (in plane), (No proof is needed-Statements only).

Trigonometry

Unit IV
Expansions for sin nθ , cos nθ, tan nθ when n is a positive integer – Expansion for $\tan(\theta_1 + \theta_2 + \ldots + \theta_n)$- Expansions for $\cos^n \theta$ and $\sin^n \theta$ in terms of multiples of θ - Expansions of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in terms of θ.

Unit V
Euler's formula - Hyperbolic functions – Relation between the circular and hyperbolic functions – Inverse hyperbolic functions sinh^{-1}x, cosh^{-1}x and tanh^{-1}x in terms of logarithmic functions- Separation into real and imaginary parts of $\sin(x+iy), \cos(x+iy), \tan(x+iy), \sinh(x+iy), \cosh(x+iy), \tanh(x+iy)$ and $\tan^{-1}(x+iy)$.

Text Book

S.G.Venkatachalapathy, Allied Mathematics, Margham Publications, Chennai, Reprint 2011.

Unit   I   Chapter 17 – pg. 17.1-17.41.
Unit IIChapter 17 – pg. 17.41-17.70
Unit III   Chapter 17 – pg. 17.71-17.107
Unit IV   Chapter 8   – pg. 8.1-8.26
Unit V   Chapter 8   – pg. 8.26-8.45

Reference(s)

1. S.Narayanan, T.K.Manickavasagam Pillai, Ancillary Mathematics, Vol. III, S.Viswanathan   Pvt. Ltd.,
    Reprint 1999.
2. S.Narayanan, T.K.Manickavasagam Pillai, Trigonometry,S.Viswanathan   Pvt. Ltd., Reprint 2004.
3.   P.Duraipandian, Laxmi Duraipandian and Jayamala Paramasivan, Trigonometry, Emerald Publishers,
    Reprint 1999.

(For the B.Sc. Chemistry candidates admitted from the academic year 2016 onwards)
Allied Course III – Differential Equations and Laplace Transforms

Sem. II   **Code : U16MAC23**
No. of hrs. 5   **Credit: 4**

Objectives:
1. To introduce the methods of solving PDEs & higher order ODEs.
2. To introduce the techniques of transforms and their applications.

Differential Equations
Unit I

Ordinary Differential Equations – First Order and Higher Degree – Equation solvable for $\dfrac{dy}{dx}$ - Equation solvable for y – Equation solvable for x (simple problems only) – Clairaut's Form. (simple case only)

Unit II
Derivation of Partial Differential Equations by elimination of arbitrary functions – classification of Integrals – some standard types of First Order Partial Differential Equations – Other standard forms.

Laplace Transforms
Unit III
Definition – Condition for the existence of the Laplace Transforms – Properties of Laplace Transforms – Laplace Transform of some standard functions – Some general theorems.

Unit IV
The Inverse Laplace Transforms – Shifting theorem for Inverse Transform – The method of partial fraction can be used to find the Inverse transform of certain functions – Related theorems.

Unit V
Special cases – applications to solutions of Differential Equations.

Text Book

S.G.Venkatachalapathy, Allied Mathematics(in single volume), Margham Publications, Chennai, Reprint 2011(Units I - V)

        Unit I   Chapter 13 - Pg.13.1 – 13.33
        Unit II   Chapter 15 - pg 15.1 – 15.35
        Unit III Chapter 16 - pg. 16.1 – 16.22
        Unit IVChapter 16 - pg. 16.25 – 16.35
        Unit V Chapter 16 -pg. 16.35 – 16.66

Reference(s)

1. S. Narayanan and T. K. Manichavasagam Pillai, Calculus (Vol. III) S.Viswanathan Printersand Publishers, Reprint 2004.
2. Vittal.P.R., Allied Mathematics, Margham publications, Chennai, Reprint 2000.

3.Narasing Deo, Graph theory with applications to Engineering and Computer science, Prentice hall of India, New Delhi, Fifteenth printing, 1999.

Sem. I	Code :U16MAZ11
No. of hrs. 5	Credit: 4

Objectives:

      1. To introduce the field of operations research which has many applications in managementtechniques.

      2. To help students to find optimum solution in business and management problems.

Unit I

Introduction to Operations Research-Linear programming problem - Introduction – General LPP – Basic feasible solution – Optimum basic feasible solution – Alternate basic feasible solution – Degenerate solution – Unbounded solution – Graphical solution method – Simplex method.

Unit II

Linear programming problem - Artificial variable techniques – Big–M method – Two phase method.

Unit III

Transportation Problem - Definition – formulation and solution of transportation problem – Initial Basic Feasible Solution – North-West corner , Row Minima, Column Minima, Matrix Minima, Vogel's Approximation Method – Optimum Basic Feasible Solution – MODI method.

Unit IV

Assignment Problem - Definition – Comparison with transportation problem – Formulation and solution of assignment problems – Hungarian method – Unbalanced assignment problems.

Unit V

Networks – PERT - CPM - Introduction – Network and basic components – Rules of network construction – Time calculations in networks – Critical Path Method - Time calculations in PERT – Probability of meeting the scheduling time – PERT algorithm – Related problems.

Text book:

KantiSwarup, P. K. Gupta and Manmohan, Operations research, Sultan Chand & Sons Educational Publishers, New Delhi, 14th Edition 2008.

        Unit I   Chapter 3: 3.1- 3.5

                Chapter 4 : 4.1,4.3

        Unit II   Chapter 4 : 4.4

        Unit III   Chapter 10 : 10.1 ,10.2, 10.5, 10.8 - 10.10 ,10.12,10.13

        Unit IV   Chapter 11 : 11.1 – 11.4

        Unit V   Chapter 25 : 25.1 – 25.4, 25.6-25.8

Reference(s)

1. Hamdy A.,Taha, Operation Research, Keerthi Publishing House , 1997.
2. S. DharaniVenkatakrishnan , Operation Research , Keerthi Publishing House, 1997.
3. S. D. Sharma Kedarnath , Operation Research, Ramnath Publishers and Co., Meerut 1997.
4. M. P. Gupta, J. K. Sharma, Operation Research for Management, National Publishing House, 1992.

Sem. II   Code :U16MAZ22
No. of hrs. 4   Credit: 4

Objectives:
1. To introduce numerical methods for solving algebraic and simultaneousequations.
2. To learn the techniques of numerical differentiation integration and ordinary differential equations.

Unit I
Introduction to Numerical Analysis-Solution of algebraic and transcendental equations – Bisection method – Iterative method – RegulaFalsi method – Newton Raphson Method.

Unit II
Solution of simultaneous linear algebraic equations – Direct method – Gauss Elimination method – Iterative methods – Gauss Seidel method.

Unit III
Interpolation – Gregory Newton's forward and backward interpolation formulae – Lagrange's interpolation formula – Inverse interpolation formula.

Unit IV
Numerical Integration – Trapezoidal rule, Simpson's one-third rule.

Unit V
Numerical solution of ordinary differential equations – Euler's method – Modified Euler's method – Runge-Kutta 2nd order – Runge-Kutta 4th order (Problems only)

Text Book

P. Kandasamy, K. Thilagavathy, K. Gunavathy, Numerical Methods, S.Chand& Company Ltd, Reprint 2009.

        Unit   I   Chapter 3   § 3.1, 3.2, 3.2.1, 3.3, 3.4 (theory not included)
        Unit II   Chapter 4   § 4.1, 4.2, 4.7, 4.9
        Unit III   Chapter 6   § 6.1, 6.2, 6.3
                      Chapter 8   § 8.7, 8.9
        Unit IV   Chapter 9   § 9.7, 9.9, 9.13
        Unit V   Chapter 11 § 11.1, 11.9, 11.11, 11.12, 11.13

Reference(s)
 S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Private Limited

Allied Course III- Probability & Statistics

Sem . II   **Code : U16MAZ23**
No of hrs: 4   **Credit: 4**

Objectives:
1. To introduce basic concepts in Probability and Statistics.
2. To introduce various statistical methods.

Unit I
Range-The mean deviation-The standard deviation- difference between mean and standard deviation-calculation of standard deviation of variation.

UnitII
Skewness- (without derivations) - measure of skewness based on moments- kurtosis- measures of kurtosis.

UnitIII
Correlation: Karl Pearson's coefficient of correlation Spearman's rank correlation coefficient (formula alone)- correlation coefficient-Regression -regression equations of Y on X – regression equations of X on Y.

Unit IV
Classical or a priori probability-axiomatic approach to probability- calculation of probability-Theorems of probability-conditional probability- Baye's theorem-Mathematical expectation-Random variable and probability distribution.

Unit V
Binomial distribution- Poisson Distribution-definition- relation between Binomial, Poisson and Normal distribution-properties of normal distribution- Area under the Normal curve.

Text Book:

S.P.Gupta, "Statistical Methods", Sultan Chand & Sons, Reprint 2009.
Note : emphasis to be given to the problems only

Unit I, II, III: Volume I- Chapter 8, 9,10, 11 (with specific sub-headings as given above)
Unit IV, V: Volume II- Chapter I and II   (with specific sub-headings as given above)

Reference(s)

S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, fourteenth edition, (2004).

Sem. III   **Code   : U14MA3E1**
No. of hrs. : 2   **Credit : 2**

Objective:

> To develop skills in aptitude and arithmetic

Unit I
Numbers - HCF & LCM – Decimal Fractions – Simplification.

Unit II
Square roots and Cube roots - Percentage – Average – Ratio and Proportion - Partnership.

Unit III
Profit and Loss - Time and Work- Pipes and Cisterns - Time and Distance

Unit IV
Problems on Trains – Problems on Boats and Streams - Problems on Numbers - Problems on ages.

Unit V
 Simple interest – Compound interest Area - Volume & Surface Areas.

Text Book

R.S. Aggarwal, Objective Arithmetic S. Chand and Company Ltd., New Delhi, 2003.

SBEC Course III – Mathematics of Finance

Sem. IV   **Code : U08MA4S3**
No. of hrs. 2   **Credit: 2**

Objectives:
   To apply the mathematical tools in solving problems related to finance & insurance.

Unit I
Calculus-functions, limits, continuity-derivatives-revenues-marginal revenues-average revenues-marginal cost-average cost-elasticity of demand.

Unit II
Time value of Money-Interest rate and discount rate-Present value and future value-Annuities and its kinds for discrete case.

Unit III
Time value of Money-Interest rate and discount rate-Present value and future value-Annuities and its kinds for continuous case.

Unit IV
Insurance Fundamentals-Insurance defined-Meaning of loss-chances of loss, peril, hazard, and proximate cause in insurance-costs and benefits of insurance to the society and branches of insurance-life insurance and various types of general insurance.

Unit V

Life Insurance Mathematics-Construction of Mortality Tables-Computation of Premium of Life Insurance for a fixed duration.

Reference Books:

1. Business Mathematics by D.C. Sanchete and V.K. Kapoor (Sultan Chand & Sons)
2. Business Mathematics by P.R. Vittal (Margham Publications)
3. An introduction to Mathematics by S.D. Jayaseelan & V. Sundaresan (S. Chand & Co., New Delhi)
4. Sheldon M. Ross, An Introduction to Mathematical Finance, Cambridge University press.
5. Mark S. Dorfman, Introduction to Risk Management and Insurance, Prentice Hall, Englwood cliffs, New Jersey.

Allied Course I – Algebra, Calculus and Differential Equations

Sem. I   **Code : U08MAY11**

No. of hrs. 5   **Credit: 4**

Objectives:
1. To study the characteristic roots of the matrix.
2. To introduce several techniques of differentiation and integration of real valued functions.
3. To learn the methods of evaluating double and triple integrals.
4. To expose differential equations as a powerful tool in solving problems.

Unit I

Characteristic roots of a square matrix - Evaluation of Eigen values and Eigen vectors - Verification of Cayley – Hamilton Theorem.

Unit II

Leibnitz's theorem (statement only) for the nth derivative of a product of functions – Applications - Curvature and radius of curvature in Cartesian Co-ordinates .

Unit III

General properties of definite integrals (without proof) and problems using these properties - Reduction formula for $\int e^{ax} x^n \, dx$, $\int \sin^n x \, dx$, $\int \cos^n x \, dx$, where n is a positive integer-

Evaluation of $\int_{0}^{\infty} e^{-ax} x^n \, dx$, $\int_{0}^{\pi/2} \sin^n x \, dx$, $\int_{0}^{\pi/2} \cos^n x \, dx$ where n is a positive integer.

Unit IV

Equation of First order not of First degree Equation solvable for dy/dx. Equation solvable for y- Equation solvable for x.(Simple problems only)- Clairaut's form (Simple case only).

Unit V

Formation of partial Differential equations by elimination of constants and arbitrary function- Definition of general, Particular and complete solution of partial differential equations- singular integral(Geometrical meaning not expected) solution of first order equations in their standard forms. $F(p_1 q)=o$, $F(x_1 p_1 q)=0$, $F(y_1 p_1 q)=0$, $F(z_1 p_1 q)=0$, $F_1(x_1 p)=F_2(y_1 q)$, $Z=p_x+q_y+f(p_1 q)$.

Text Books

1. T.K. Manickavasagam Pillai, T.Natarajan & K.S.Ganapathy, Algebra (Vol. II), S. Viswanathan Pvt.Ltd, Reprint, 2004 (Unit I).
2. S. Narayanan & T. K. Manickavasagam Pillay, Calculus (Vol. I), S. Viswanathan printers and publishers , Reprint 2003(Unit II).
3. S. Narayanan & T. K. Manickavasagam Pillay, Calculus (Vol. II), S. Viswanathan printers and publishers, Reprint 2003(Units III).
4. S,Narayanan&T.K.Manickavasagam Pillay, Calculus (Vol.III), S.Viswanathan Pvt.Ltd Reprint, 2004 (Units IV&V).

Unit I   Chapter 2 § 16
Unit II   Chapter 3 § 2.1,2.2 & Chapter 10 § 2.1,2.2,2.3,2.4
Unit III   Chapter 1 § 4, 11, 13.1, 13.3, 13.4
Unit IV   Chapter 1 § 5, 5.1, 5.2, 5.3, 5.4, 6.2
Unit V   Chapter 4 § 1, 2, 2.1, 2.2, 3, 5, 5.1, 5.2, 5.3, 5.4

[*Derivations are not included and **only** applications are to be expected from the students]

Reference(s)
1. Shantinarayanan, Differential and integral calculus.
2. S.Sudha, Algebra, Analtical Geomentry of (2D) and Trigonometry, Emarald Publishers, First edition, 1998.
3. M.K Venkataraman, Engineering Mathematics –Volume, National Publishing Company,1999.
4. S.Sudha, Differential Equations and integral Transforms, Emarald Publishers, 2003.

Allied Course II - Vector Calculus & Analytical Geometry of Three Dimensions

Sem. II   Code : U08MAY22

No. of hrs. 4   Credit: 3

Objectives:
1. To learn applications of single, double and triple integrals.
2. To introduce vector calculus and study the relation between surface and volume integrals.
3. To study straight lines and spheres.

Vector Calculus

Unit I
Vector Differentiation – Vector differential operator (∇), Gradient, Directional derivatives unit normal vector to the surface, divergence, solenoidal vector, Curl, irrotational vector, vector identities.

Unit II
Vector integration – line integral – surface integral – volume integral

Unit III
Gauss divergence theorem (statement only) verification and application – Green's theorem (statement only) and applications - Stoke's theorem (statement only), verification and application.

Analytical geometry of three dimensions

Unit IV
Straight line- equation of a straight line – condition for a straight line to lie on a given plane – condition for coplanarity - shortest distance between two straight lines.

Unit V
Sphere – Standard equation – Length of the tangent from any point – Equation of a tangent plane – condition for the plane to touch the sphere- Intersection of a plane and a sphere - Intersection of two spheres – Equation of a sphere passing through a given circle.

Text Books

1. K. Viswanathan and S. Selvaraj, Vector Analysis, Emerald Publishers, Chennai, 1999 (Units I, II & III).
2. S.Narayanan, R.Hanumantha Rao, T.K.Manickavasagam Pillay and P.Kandasamy, Ancillary Mathematics, Vol. IV, S. Viswanathan printers and publishers Pvt. Ltd., 1996 (Units IV & V).

      Unit I   Chapter 2 (except §2.2.5)
      Unit II   Chapter 3 § 3.2 – 3.7
      Unit III Chapter 4 § 4.2, 4.4
      Unit IV Chapter 3 (Pages 70 - 85)
      Unit V   Chapter 4 (Pages 86 - 99)

Reference(s)

1. P. Duraipandian, Laxmi Duraipandian & D. Muhilan, Analytical Geometry of three Dimensions, Emerald Publishers, Chennai, 2003.
2. P.R.Vittal, V.Malini, Vector Calculus, Fourier Series and Fourier Transforms, Margham Publications, First Print, 2004.

(For the Physics & Chemistry candidates admitted from the academic year 2008 onwards)

Allied Course III - Trigonometry, Laplace Transforms & Fourier Series

Sem. II   **Code : U08MAY23**

No. of hrs. 4   **Credit: 3**

Objectives:
> 1. To study the expansions of various trigonometric functions in terms of θ and multiples of θ and hyperbolic functions.
> 2. Introduction of Laplace transform techniques to solve ODE's .
> 3. To represent periodic functions as Fourier series.

Trigonometry

Unit I

Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ (n is a positive integer) – Related problems – Expansion of $\cos\theta$, $\sin\theta$ in terms of θ - Expansion of $\cos^n\theta$, $\sin^n\theta$ in a series of sines and cosines of multiples of θ, given in radians (proof not required) and simple problems.

Unit II

Euler's formula for $e^{i\theta}$. Definition of hyperbolic functions – relation between the circular and hyperbolic functions – Formula involving hyperbolic functions – Expansion of sinhx and coshx in power of x. Inverse hyperbolic functions $\sinh^{-1}x$, $\cosh^{-1}x$ and $\tanh^{-1}x$ in terms of logarithmic functions separation into real and imaginary parts of $\sin(x + iy)$, $\cos(x + iy)$, $\tan(x + iy)$, $\sinh(x + iy)$, $\cosh(x +iy)$ and $\tanh(x + iy)$, $\tan^{-1}(x+iy)$

Laplace Transforms

Unit III

Definition – Laplace transform of functions e^{at}, cos at, sin at and t^n where n is a positive integer. First shifting theorem – Laplace transform of e^{-at} f(t) is $\phi(s + a)$ – Laplace transform of e^{-at} cos bt, e^{-at} sin bt and e^{-at} f(t) – Laplace transform of f $'$ (t) and f $''$(t).

Unit IV

Inverse Laplace transform relating to the standard forms – Application to the solution of ordinary differential equations with constant coefficients involving the above transformations.

Fourier Series

Unit V :

Definition of Fourier series – Finding Fourier coefficients for a given periodic function with period 2π (odd and even function) – Half range series.

Text Books

1. S. Narayanan, T. K. Manickavasagam Pillai , Trigonometry, S. Viswanathan Pvt. Ltd., Reprint 2004, (Units I , II).
2. S. Narayanan, T. K. Manickavasagam Pillai , Calculus Volume III, S.Viswanathan Pvt. Ltd, Reprint 2004, (Units III, IV & V)

       Unit   I   Chapter 3   § 1, 2 (pg. 61-68), 4, 4.1, 5
       Unit II   Chapter 4   § 1, 2, 2.1, 2.2, 2.3
       Unit III Chapter 5   § 1, 2, 4
       Unit IV Chapter 5   § 6, 7, 8
       Unit   V Chapter 6   § 2, 3, 3.1, 3.2, 4

Reference(s)

1. S. Sudha, Differential Equations and Integral Transforms, Emerald publishers, Reprint 2003.
2. P. Duraipandian, Laxmi Duraipandian and Jayamala Paramasivan, Trigonometry, Emerald Publishers, Reprint 1999.

Allied Course I - Mathematical and Statistical Methods

Sem. I   **Code : U13MAC11**
No. of hrs. 5   **Credit: 4**

Objectives:
1. To study special properties of matrices.
2. To introduce successive differentiation and reduction formulae for integrals.
3. To introduce basic concepts in Statistics.
4. To develop skills in solving problems using numerical techniques.

Unit I

Eigen values and Eigen vectors - Cayley – Hamilton Theorem – Diagonalisation of matrices(problems only)

Unit II

Differentiation – Definition - Rules for differentiation – Standard forms – Successive differentiation – n^{th} derivatives – Standard forms – Use of Partial fractions – Applilcation of De-Moivre's theorem – Trigonometrical transformations - Leibnitz's Theorem (statement only) on the nth differential coefficient of the product of two functions of x (problems only)

Unit III

Introduction – Methods of Integration – Integrals of the functions involving $a^2 \pm x^2$ - Integrals of functions of the form $\int f(x)^n \, f'(x)dx$ – Definite Integral – Properties of definite integrals - Reduction formulae for standard definite integrals :

$$\int_0^\infty e^{-ax} x^n \, dx, \quad \int_0^{\pi/2} \sin^n x \, dx, \quad \int_0^{\pi/2} \cos^n x \, dx \text{ where n is a positive integer.}$$

Unit IV
Measures of Central tendency – Arithmetic mean, Median, Mode – Dispersion – Range, Standard deviation – Correlation – Definition – Types of correlation – Karl Pearson's coefficient of correlation – Rank correlation coefficient – Regression – Definition – Correlation & Regression – Regression equation of Y on X , Regression equation of X on Y (problems only)

Unit V

Finite differences – Forward and backward differences – Interpolation – Gregory-Newton's forward and backward interpolation formula – central difference interpolation formula – Stirling's formula (problems only)

Text Books

1. S.G.Venkatachalapathy, Allied Mathematics (in single volume), Margham Publications, Chennai , Reprint 2011(Units I & III)
2. Dr. M. K. Venkataraman , Dr. Manorama Sridhar, Allied Mathematics Vol-II, Agasthiar Publications first edition, July 2006 (Unit II)
3. R .S .N. Pillai , V. Bagavathi , Statistics, S.Chand & Company Ltd, Reprint 2005 (Unit IV)
4. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company Ltd, Reprint 2009.

      Unit   I   Chapter 6 - 6.10 , 6.11
      Unit II   Chapter 1   - 1.1 , 1.2 , 1.3
                 Chapter 2   - 2.1 , 2.2 2.3, 2.4, 2.5,2.6
      Unit III Chapter 10 - pg. 10.1 – 10.28 , 10.99-10.115, 10.135- 10.164
      Unit IV Chapter 9   - pg. 121-159 , 170-175
                 Chapter 10   - pg229-235 , 249-259
                 Chapter 12   - pg 363 – 381 , 389 – 393
                 Chapter 13   -pg 431- 441
      Unit V   Chapter 5 - 5.1 , 5.2
                 Chapter 6 – 6.1 , 6.2 , 6.3
                 Chapter 7 – 7.1 , 7.2 , 7.5

Reference(s)

1.T. K. Manichavasagam Pillai, T. Natarajan & K. S. Ganapathy, Algebra (Vol.II) , S. Viswanathan pvt.ltd. Reprint 2004.
2.S. Narayanan and T. K. Manichavasagam Pillai, Calculus (Vol. I, II) Viswanathan Printers and Publishers, Reprint 2003.
3. M. K. Venkataraman, Engineering Mathematics, National Publishing Company,1999.
4. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, fourteenth edition, (2004).
5. S.P.Gupta, "Statistical Methods", Sultan Chand & Sons, thirty fourth edition, (2005).
6. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Private Limited.

Allied Course III – Differential Equations, Laplace Transforms and Graph Theory

Sem. II   **Code : U13MAC23**
No. of hrs. 5   **Credit: 4**

Objectives:
1. To introduce the methods of solving PDEs & higher order ODEs.
2. To introduce the techniques of transforms and their applications.
3. To introduce the basic concepts in Graph Theory

Differential Equations
Unit – I

Ordinary Differential Equations – First Order and Higher Degree – Equation solvable for $\dfrac{dy}{dx}$ -
Equation solvable for y – Equation solvable for x (simple problems only) – Clairaut's Form. (simple case only)

Unit – II
Derivation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions – classification of Integrals – some standard types of First Order Partial Differential Equations – Other standard forms.

Laplace Transforms
Unit – III
Definition – Condition for the existence of the Laplace Transforms – Properties of Laplace Transforms – Laplace Transform of some standard functions – Some general theorems.

Unit – IV
The Inverse Laplace Transforms – Shifting theorem for Inverse Transform – The method of partial fraction can be used to find the Inverse transform of certain functions – Related theorems – Special cases – Applications to solutions of Differential Equations.

Graph Theory
Unit – V
Definition and Examples – Degrees – Sub graphs – Isomorphism – Matrices – Operations on Graphs.

Text Books

1.S.G.Venkatachalapathy, Allied Mathematics(in single volume), Margham Publications, Chennai, Reprint 2011(Units I ,II, III, IV)
2.S. Arumugam, S. Ramachandran, Invitation to Graph Theory , Scitech Publications (India) Pvt Ltd, Chennai , 6th Reprint 2006 (Unit V)

Unit   I   Chapter   8 - pg. 8.1 – 8.26
Unit II   Chapter   8 - pg. 8.26 – 8.45
Unit III   Chapter 16 - pg. 16.1 – 16.22
Unit IV   Chapter 16 - pg. 16.25 – 16.56

Unit V   Chapter   2 - 2.1, 2.2, 2.3, 2.4, 2.8, 2.9

Reference(s)

1. S. Narayanan and T. K. Manichavasagam Pillai, Calculus (Vol. III) S.Viswanathan Printers and Publishers, Reprint 2004.
2. Vittal.P.R., Allied Mathematics, Margham publications, Chennai, Reprint 2000.
3. Narasing Deo, Graph theory with applications to Engineering and Computer science, Prentice hall of India, New Delhi, Fifteenth printing, 1999.