## DEPARTMENT OF MATHEMATICS

**PROGRAMME OUTCOMES (PO):**

- **PO 1:** To provide a deep knowledge in all disciplines of mathematics and motivate them to pursue higher studies, research and face competitive exams with confidence.
- **PO 2:** To provide students adequate knowledge to identify, formulate and solve real life problems using advanced tools in Mathematics.
- **PO 3:** To develop the power of reasoning, critical and logical thinking and to enhance arithmetic and numerical abilities.

**PROGRAMME SPECIFIC OUTCOMES (PSO):**

- **PSO1:** Students understand and acquire a fair knowledge in Algebra, Trigonometry, Analytical Geometry, Differential and Integral Calculus, Differential Equations and Numerical Analysis.
- **PSO2:** Enable the students to enhance their knowledge in Transform Techniques, Mathematical Statistics, Discrete Mathematics, Graph Theory and Operations Research.
- **PSO3:** Facilitate the students to have a thorough knowledge in Dynamics, Statics, Algebraic Structures and Linear Algebra, Real and Complex Analysis.
- **PSO4:** To develop the skills in analyzing and interpreting data, enhance computing skills using C-Programming and to formulate and solve problems.

## SYLLABUS

**Subject Name: Algebra**                                                   **Year: I**

**Subject Code: SM21A**                                                     **Semester: I**

### UNIT I

Theory of equations : Polynomial equations with imaginary and irrational roots - Relation between roots and coefficients - Symmetric functions of roots in terms of coefficients.
Chapter 6: Section 9 to 12.

### UNIT II

Reciprocal equations – Standard form -Increase or decrease the roots of the given equation - Removal of terms Approximate solutions of roots of polynomials by Horner"s method.
Chapter 6: Section 16,16.1,16.2,17,30

### UNIT III

Summation of Series : Binomial -Exponential - Logarithmic series (Theorems without proof):
Chapter 3: Section 10, Chapter 4: Section 3, 3.1, 3.5, 3.6, 3.7 (omit 3.4).

### UNIT IV

Symmetric - Skew Symmetric – Hermitian - Skew Hermitian - Orthogonal Matrices – Eigen values and Eigen vectors - Similar matrices - Cayley - Hamilton Theorem. Chapter 2: Section 6.1 to 6.3, 9.1, 9.2, 16, 16.1, 16.2, 16.3.

### UNIT V

Prime number and Composite number - divisors of a given number N- Euler"s function (without proof) Integral part of a real number - congruences..
 Chapter 5: Section 1 to 13.

### Contents and treatment as in

1. Algebra, Volume I by T. K. ManicavachagamPillay,T.Natarajan,
   K.S.Ganapathy, Viswanathan Publication          2007 - Unit – 1 and 2.
2. Algebra, Volume II by T. K. ManicavachagomPillay ,T.Natarajan
   ,K.S.Ganapathy, Viswanathan Publication 2008  - Unit – 3, 4 and 5.

### Reference:-

1. Algebra by S. Arumugam (New Gama publishing house, Palayamkottai) .
2. Algebra and Trigonometry, Volume I and II by P.R.Vittal, V.Malini (Margham Publishers).

**e-Resources:**

1. http://mathworld.wolfram.com
2. http://www.themathpage.com/

## COURSE OUTCOME

**CO1:** Evaluate the roots of the polynomial equations.

**CO2:** Solving Problems of reciprocal equations. and Solve equations by increasing or decreasing roots.

**CO3:** Obtain the summation of series.

**CO4:** Learn the types of matrices, matrix using Eigen values, Eigen vectors and solve problems based on Cayley Hamilton theorem.

**CO5:** Understand the concepts of Number Theory and Euler function.

**Subject Name: Differential Calculus**                    **Year: I**
**Subject Code: SM21B**                                    **Semester: I**

### UNIT I

Successive differentiation - $n^{th}$ derivative- standard results –
Trigonometrical transformation –
Formation of equations using derivatives - Leibnitz's theorem and its
applications. Chapter 3 section 1.1 to 1.6, 2.1 and 2.2

### UNIT II

Total differential of a function – special cases – implicit functions - partial
derivatives of a function of two functions - Maxima and Minima of functions of
two variables- Lagrange's method of undetermined multipliers.
Chapter 8 : Section 1.3 to 1.5 and 1.7, Section 4, 4.1 and 5.

### UNIT III

Envelopes – method of finding envelopes – Curvature- circle, radius and centre of
curvature- Cartesian formula for radius of curvature – coordinates of the centre of
curvature – evolute-and involute - radius of curvature and centre of curvature in polar
coordinates – p-r equation
Chapter 10 Section 1.1 to 1.4 and Section 2.1 to 2.7

### UNIT IV

Polar coordinates - angle between the radius vector and the tangent – slope of the tangent
in the polar coordinates – the angle of intersection of two curves in polar coordinates-
polar sub tangent and polar sub normal – the length of arc in polar coordinates.
Chapter 9 Section 4.1 to 4.6

### UNIT V

Definition-Asymptotes parallel to the axes – special cases – another method for finding
asymptotes - asymptotes by inspection – intersection of a curve with an asymptote.
Chapter 11 - Section 1 to 7.

**Content and treatment as in**
"Calculus", Volume - 1 by S. Narayanan and T.K. Manicavachagompillay - S.Viswanathan
publishers – 2006

**Reference:-**
1. Calculus , Dr. P.R. Vittal&Dr. V. Malini, Margham
   Publications, Chennai.
2. Calculus by Thomas and Fenny, Pearson Publication.
3. Calculus by Stewart Calculus Dr. P.R. Vittal&Dr. V. Malini,
   Margham Publications, Chennai.

**e-Resources:**
1. http://www.themathpage.com/
2. http://mathworld.wolfram.com
3. http://www.univie.ac.at/future.media/moe/galerie.html
4. http://www.analyzemath.com/calculus

## COURSE OUTCOME

**CO1:** Learn successive differentiation and Lebinitz"s theorem.
**CO2:** Evaluate maxima and minima of a function of two or more variables.
**CO3:** Understand the concepts of envelope-evolute-involute-curvature.
**CO4:** Evaluate polar sub tangents, sub normal and length of arc in polar co ordinates.
**CO5:** Evaluate asymptotes of a curve.

**Subject Name: Calculus Of Finite Differences And Numerical Analysis-I     Year: I**
**Subject Code: SM3AB                                                         Semester: I**

### UNIT I

Solutions of algebraic and transcendental equations: Bisection method- Iteration method- Regula-falsi method- Newton-Raphson method. - Chapter 1 :Section 1.1 - 1.4.

### UNIT II

Solutions of Simultaneous Linear Equations: Gauss-Elimination method, Gauss-Jordan method, Crout"s method, Gauss-Seidel method. - Chapter 2 :Section 2.1 - 2.4 , 2.6.

### UNIT III

Finite Differences: E operators and relation between them- Differences of a polynomial- Factorial polynomials- inverse operator $\Delta^{-1}$ -Summation Series. - Chapter 3 :Section 3.1 to 3.4, 3.6, 3.7.

### UNIT IV

Interpolation with Equal Intervals:Newton's Forward and Backward Interpolation formulae- Central Differences Formulae: Gauss-Forward and Backward Formulae- Stirling's Formula and Bessel's Formula-Equidistant terms with one or more missing values.
Chapter 4:Section 4.1- 4.3 (omit 4.1a, 4.4), 4.7 . - Chapter 5 :Section 5.1- 5.6.

### UNIT V

Interpolation with Unequal Intervals: Divided Differences - Newton's Divided Differences Formula for Interpolation –Lagrange's Formula for Interpolation-Inverse Interpolation- Lagrange's method- Reversion of Series method. - Chapter 6 :Section 6.1, 6.2, 6.5, 6.7.

**Content and Treatment as in**

"Calculus of Finite Differences and Numerical Analysis" by P. Kandasamy and
 K. Thilagavathy, S. Chand and Co Pvt.Ltd.

**Reference:**

1. "Numerical Analysis " by B. D. Gupta, Konark Publishing.
2. "Numerical methods in Science and Engineering" by M. K. Venkataraman, National Publishing House, Chennai.

**e-Resources:**

1. https://nptel.ac.in
2. https://www.encyclopediaofmath.org/index.php/Finite-difference_calculus


**COURSE OUTCOME**

**CO1:** Solve Algebraic and Transcendental Equations.
**CO2:** Obtain the solution of simultaneous linear equations.
**CO3:** Understand the concept of finite differences and summation of series.
**CO4:** Evaluate interpolation with equal intervals.
**CO5:** Evaluate interpolation with unequal intervals and reversion of series

**Subject Name: Non-Major Elective - Basic Elements of Logistics Management  Year: I**
**Subject Code: AY51A                                                                          Semester: I**

## Unit – I

Logistics – Concept & Significance – Logistics System Fundamentals – Transport System: Railway, Road, Air, Waterways, Pipe Lines, Animals and Animal driven vehicles – Economics of transportation – Stocking Policies – Storage and handling capacities – Warehousing.

## Unit – II

Packaging – Principles, functions and types – Containerization – Concepts – Infrastructure – Inventory Policy – Concept of Supply Chain Management and its strategic role in the organization – Intra and Inter Organization Supply Chain.

### Suggested Readings:

1. Strategic Logistics Management – Lambert
2. Logistical Management – The Integrated Supply Chain Process – Bowersox
3. Logistics & Supply Chain Management – Christopher
4. Supply Chain Management – Sunil Chopra
5. Logistics & Supply Chain Management – Raghuram
6. Supply Chain Management for 21st Century – Sahay.

## COURSE OUTCOME

**CO1**: Discuss the concepts and significance of Logistics.
**CO2:** Explain the different modes of Transport system.
**CO3:** Enumerate stacking policies and storage handling capacities
**CO4**: Describe Principles, functions and types of Packaging
**CO5:** Explain the concept of supply chain management

**Subject Name: Trigonometry**                                    **Year: I**
**Subject Code: SM22A**                                           **Semester: II**

## UNIT I

Expansions of powers of $\sin\theta$, $\cos\theta$ - Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta\sin^n\theta$ Chapter 2, Section 2.1, 2.1.1, 2.1.2, 2.1.3

## UNIT II

Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ - Expansions of $\tan(\theta_1+\theta_2 + ......... +\theta_n)$ - Expansions of sin x, Cosx, tanx in terms of x-Sum of roots of trigonometric equations – Formation of equation with trigonometric roots. Chapter 3, Section 3.1 to 3.6

## UNIT III

Hyperbolic functions-Relation between circular and hyperbolic functions - Formulas in hyperbolic functions – Inverse hyperbolic functions . Chapter 4, Section 4.1 to 4.7 .

## UNIT IV

Inverse function of exponential functions – Values of Log (u+iv) - Complex index. Chapter 5, Section 5.1 to 5.3

## UNIT V

Sums of Trigonometric series – Applications of binomial,exponential, , logarithmic and Gregory's series - Difference method. Chapter 6, Section 6.1 to 6.6.3

**Content and treatment as in**

Trigonometry by P. Duraipandian and KayalalPachaiyappa, Muhil Publishers.

**Reference:-**
1. Trigonometry, Calculus , Dr. P.R. Vittal , Margham Publications, Chennai.
2. Trigonometry by T.K. Manickavachagam Pillay.S.Viswanathan (Printers and Publishers ) Pvt.Ltd.

**e-Resources:**

1. http://mathworld.wolfram.com
2. http://ocw.mit.edu/courses/mathematics/

**COURSE OUTCOME**

**CO1:** Evaluate the expansions of trigonometric functions.

**CO2:** Obtain the sum of roots of trigonometric equations and form the equations with Trigonometric roots.

**CO3:** Understand the concepts of circular, hyperbolic and inverse hyperbolic functions.

**CO4:** Evaluate the Logarithm of complex numbers.

**CO5:** Obtain the summation of trigonometric series.

**Subject Name: Integral Calculus And Vector Analysis**          **Year: I**
**Subject Code: SM22B**                                          **Semester: II**

## UNIT I
Reduction Formulae - Types $\int x^n e^{ax}\, dx$, $\int x^n \cos ax\, dx$, $\int x^n \sin ax\, dx$, $\int \cos^n x dx$, $\int \sin^n x dx$, $\int \sin^m x \cos^n x dx$, $\int \tan^n x dx$, $\int \cot^n x dx$, $\int \sec^n x dx$, $\int \csc^n x dx$, $\int x(\log x)^m dx$.
Bernoulli's formula.
Chapter – 1: Section 13, 13.1 to 13.10, 14, 15.1

## UNIT II
Multiple Integrals - definition of the double integrals - evaluation of the double integrals - double integrals in polar coordinates - triple integrals - applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces - change of variables -Jocobians .
Chapter-5: Section 1, 2.1, 2.2, 3.1, 4, 6.1, 6.2, 6.3, 7
Chapter-6: Section1.1, 1.2, 2.1 to 2.4.

## UNIT III
Beta and Gamma functions - indefinite integral - definitions - recurrence formula of Γ functions - properties of ß-functions -relation between ß and Γ functions.
Chapter – 7:  Section 1.1 to 1.4, 2.1 , 2.3, 3, 4, 5.

## UNIT IV
Introduction - directional derivative – Gradient - divergence -curl - Laplacian Differential Operator. Chapter- 2: Section 2.1 - 2.13.

## UNIT V
 Line, surface and volume integrals - Integral Theorems - Gauss, Greens and Stokes (Without proof) – Problems.
Chapter 3 Sections 3.1 to 3.6 and Chapter 4 Sections 4.1 to 4.5.

### Content and treatment as in

1. "Calculus", Vol- II by S. Narayanan and T.K. Manicavachagampillay –

 S. Viswanathanpublishers– 2007 for Unit 1 , Unit 2 , Unit 3.

2. "Vector Analysis" by P.Duraipandian and KayalalPachaiyappa, S.ChandFor Unit 4, Unit 5.

**Reference Books:**

1.  Integral Calculus and Differential equations : Dipak Chatterjee (TATA McGraw Hill Publishing companyLtd.).

2. Vector Algebra and Analysis by Narayanan and T.K.Manickvachagam Pillay S .Viswanathan Publishers.
3. Vector Analysis: Murray Spiegel (Schaum Publishing Company, NewYork).

**e-Resources:**
1. http://mathworld.wolfram.com.
2. http://www.sosmath.com.

**COURSE OUTCOME**

**CO1:** Evaluate and apply Reduction and Bernoulli"s formula in Integration.
**CO2:** Understand concepts in Multiple Integrals and calculate area and volume using
multiple integrals.
**CO3:** Understand the concepts of Beta and Gamma functions and their properties.
**CO4:** Learn vector differential operators and concepts in Solenoidal and irrotational vectors.
**CO5:** Verify Gauss,Stokes and Greens theorem using vector integration.

**Subject Name: Calculus of Finite Differences and Numerical Analysis-II**   **Year: I**
**Subject Code: SM3AF**                                                        **Semester: II**

### UNIT I

Numerical Differentiation: Derivatives using Newton's forward and backward difference formulae-Derivatives using Stirling's formula- Derivatives using divided difference formula- Maxima and Minima using the above formulae.
Chapter 7 :Section 7.1- 7.4, 7.6.

### UNIT II

Numerical Integration: General Quadrature formula- Trapezoidal rule-Simpson's one-third rule- Simpson's three-eighth rule- Weddle's rule- Euler-Maclaurin Summation formula- Stirling's formula for n!. - Chapter 7 :Section 7.7- 7.9, 7.13- 7.15.

### UNIT III

Difference equations:Linear homogeneous and nonhomogeneous difference equation with constant coefficients- particular integrals for $a^u x^m$, $x^m$, $sin kx$ and $cos kx$.
Chapter 8 :Section 8.1- 8.4, 8.6

### UNIT IV

Numerical solution of Ordinary Differential Equations (I order only):
Taylor's series method- Picard's method- Euler's method- Modified Euler's method. Chapter 9: Section 9.5-9.7, 9.9.

### UNIT V

Numerical solution of Ordinary Differential Equations (I order only):
Runge-kuttamethod(fourth order only)- Predictor-Corrector method- Milne's method - Adams-Bashforth method.
Chapter 9 : Section 9.10 - 9.14.

**Content and Treatment as in**

"Calculus of Finite Differences and Numerical Analysis" by P. Kandasamy and
 K.Thilagavathy, S. Chand and Co. Pvt.Ltd.

**Reference:**
1) "Numerical Analysis" by B. D. Gupta, Konark Publishing.
2) "Numerical methods in Science and Engineering" by M. K. Venkataraman, National Publishing House, Chennai.

**e-Resources:**

1. https://nptel.ac.in
2. https://www.encyclopediaofmath.org/index.php/Finite-difference_calculus

## COURSE OUTCOME

**CO1:** Calculate derivatives of a function and its maxima and minima using Newton's and Stirling's method.

**CO2:** Evaluate the integrals of a function using Trapezoidal, Simpson's, Weddle's rule.

**CO3:** Solve difference equation.

**CO4:** Obtain the numerical solution of ordinary difference equation using Taylor's, Picard's and Euler's method.

**CO5:** Obtain the numerical solution of ordinary difference equation using Range-Kutta, Milnes and Adams-Bashforth's Predictor- Corrector method.

**Subject Name: Non-Major Elective – Everyday Banking**          **Year: I**
**Subject Code: AY52A**          **Semester: II**

## UNIT- I

Banking – Definition – pass book – cheque book – Format of Cheque – Filling up of Cheque-Deposit Challan – Filling up – Clearing cheque – Transfer cheque – Collection Cheque – Payable at par – Demand Draft – application filling – Account Opening form – Filling up – Documents required - Debit Card – Credit Card – ATM Machine – Cash Deposit Machine – Pass book printing machine. MICR- IFSC- Fund transfer through ECS – NEFT – RTGS – Form filling for Fund transfer.

## UNIT- II

On line Banking – Sign up – Process – Requirements – Log in – Customer ID – User ID – Pass word – Hints for creating Pass words – change of pass word – on line transactions – Account statements – Fund Transfer – Payment of bills – Utility payments – Loans – Repayment for Loans – other services. Mobile Banking – meaning – importance – Advantages – Mobile Applications (App) – WAP (Wireless Application Protocol)- USSD (Unstructured Supplementary Service Data)- Registration process – through Mobiles – Process at Bank Branch – ATM- User ID-MPIN- change of MPIN –IMPS D(Immediate Mobile Payment System) - UPI(Unified Payment interface) – BHIM(Bharat Interface for money)- NPCI (National Payment Corporation of India) - Bank account Management – Transfer Funds – paying Bills – Locating ATMs - QR code payments- Alerts and notifications- Tracking Spending habits – Cash back Safe banking methods.

### Suggested Readings:
1. B.Santhanam- Banking & Financial systems, Margham Publications
2. S.N.Maheshwari Banking theory, law and practice , Kalyani Publications
3. Parameswaran- Indian Banking, S.Chand& Co.

### Web References:
1. https://en.wikipedia.org/wiki/Online_banking
2. https://www.sbi.co.in/portal/web/services/internet-banking
3. https://www.hdfcbank.com/assets/popuppages/netbanking.htm
4. https://www.investopedia.com/terms/m/mobile-banking.asp
5. www.scotiabank.com/mobile/ca/en/0,,5181,00.html

### COURSE OUTCOME

**CO1:** Explain the various instruments of day to day banking
**CO2:** Describe online banking process

## UNIT I

Chord of contact - polar and pole - conjugate points and conjugate lines - chord with $(x_1, y_1)$ as its midpoint - diameters - conjugate diameters of an ellipse - semi diameters - conjugate diameters of hyperbola

Chapter-7: Sections 7.1 to 7.3, Chapter – 8 Sections 8.1 to 8.5

## UNIT II

Polar coordinates, general polar equation of straight line - polar equation of a circle on $A_1A_2$ as diameter ,equation of a straight line, circle, conic – equation of chord, tangent, normal. Equations of the asymptotes of a hyperbola.

Chapter -10: Sections 10.1 to 10.8

## UNIT III

Introduction - System of Planes - Length of the perpendicular - orthogonal projection.

Chapter 2: Section 2.1 to 2.10

## UNIT IV

Representation of line - angle between a line and a plane - co-planar lines - shortest distance 2 skew lines - Length of the perpendicular - intersection of three planes.

Chapter -3 Section 3.1 to 3.8

## UNIT V

Equation of a sphere - general equation - section of a sphere by a plane - Equation of the circle - tangent plane-angle of intersection of two spheres – condition for the orthogonality - radical plane.

Chapter-6: Sections6.1 to 6.8

### Contents and treatment as in

1. Analytical Geometry of 2D by P. DuraiPandian -Muhilpublishers for Unit-1 and 2
2. Analytical Solid Geometry of 3D by Shanthi Narayan and Dr.P.K. Mittal for Unit - 3 to 5

### Reference Books:

1. Analytical Geometry of Two Dimensions by T. K. Manikavachakam Pillai and S. Narayanan.
2. Analytical Geometry of Three Dimensions by T. K. Manikavachakam Pillai and S. Narayanan.

**e-Resources:**

1. http://mathworld.wolfram.com
2. http://www.univie.ac.at/future.media/moe/galerie.html

## COURSE OUTCOME

**CO1:** Learn the concepts of conjugate points, lines, and diameters of conics.
**CO2:** Calculate concyclic points of a conic and asymptotes of hyperbola.
**CO3:** Understand and Find the equation of the planes.
**CO4:** Evaluate co-planar lines and shortest distance of skew lines.
**CO5:** Obtain the equations of the sphere, radical plane and orthogonal spheres.

**Subject Name: Differential Equations**                     **Year: II**
**Subject Code: SM23B**                                        **Semester: III**


**UNIT I**

Ordinary Differential Equations: Variable separable-Homogeneous Equation-Non-Homogeneous Equations of first degree in x and y-Linear Equation-Bernoulli's Equation-Exact differential equations.
Chapter 2: Section 1 to 6.


**UNIT II**

Equation of first order but not of higher degree: Equation solvable for dy/dx- Equation solvable for y Equation solvable for x- Clairaut's form-Linear Equations with constant coefficients-Particular integrals $e^{ax}$, $sinax$, $cosax$, $x^m$, $Ve^{ax}$ where $V$ is $sinax$ or $cosax$ or $x^m$ .
Chapter 4: Section 1, 2.1, 2.2, 3.1.
Chapter 5: Section 4.

**UNIT III**

Simultaneous linear differential equations- Linear Equations of the Second Order -Complete solution in terms of a known integrals- Reduction to the Normal form- Change of the Independent Variable - Method of Variation of Parameters.
Chapter 6: Section- 6
Chapter 8:Section- 1,2,3,4.


**UNIT IV**

Partial differential equation: Formation of PDE by Eliminating arbitrary constants and arbitrary functions-complete integral-singular integral-General integral- Lagrange"s Linear Equations Pp+Qq=R.
Chapter 12: Section- 1, 2, 3.1, 3.2, 4.


**UNIT V**

Special methods - Standard forms - Charpit"s Methods - Related
problems Chapter 12: Section-5.1, 5.2, 5.3, 5.4, 6. 13


**Contents and treatment** as in "Differential Equations and its applications", by S.Narayanan, T.K.Manikavachagam Pillay –- S.Viswanathan (Printers and Publishers ) Pvt. Ltd(2006).

**Reference**:

1. Mathematics for B.Sc-Branch-I Volume –III by P.Kandasamy ,K.Thilagavathy S.Chand Publications.
2. Differential equations with applications and historical notes by George F.Simmons, 2 ndEd,TataMcgraw Hill Publications .
3. Differential Equations by ShepleyL.Ross, 3 rdEd ,JohnWiely and sons 1984.
4. Differential Equations by N.P.Bali,Laxmi Publications Ltd,New Delhi-2004.
5. Ordinary and Partial Differential Equations by Dr.M.D.Raisinghania ,S.Chand.

**e-Resources:**

1.http://mathworld.wolfram.com
2. http://www.analyzemath.com/calculus/Differential_Equations/applications. html

**COURSE OUTCOME:**

**CO1:** Learn to solve ODE - homogeneous, non-homogeneous, exact and Bernouli's equations.
**CO2:** Learn to solve ODE solvable for x and y.
**CO3:** Understand and solve homogeneous linear ordinary differential equations
**CO4:** Formulate PDE by eliminating arbitrary constants/functions & solve PDE.
**CO5:** Solve PDE by standard types and Charpit's method.

**Subject Name: Mathematical Statistics I**                                    **Year: II**
**Subject Code: SM3AC**                                                        **Semester: III**

## UNIT I

Concept of sample space- Events- Definition of Probability (Classical,Statstical& Axiomatic)-
Addition and Multiplication laws of Probability- Independence- Conditional Probability- Baye's
theorem – Simple Problems.

## UNIT II

Random Variables (Discrete and Continuous) Distribution function- Expected values and
Moments Moment generating function – Probability generating function- Examples.

## UNIT III

Characteristic function- Uniqueness and Inversion theorems (Statements and applications only)-
Cumulants – Chebychev's Inequality – Simple Problems.

## UNIT IV

Concepts of bivariate distributions- Correlation and Regression- Linear Prediction- Rank
Correlation coefficient-Concepts of partial and multiple correlation coefficients- Simple
problems.

## UNIT V

Standard Distributions – Binomial- Poisson- Normal- Uniform distributions- Geometric-
ExponentialGamma -Beta distributions- Inter relationship between distributions. 21

### Reference:

1..S.C.Gupta&V.K.Kapoor : Elements of Mathematical Statistics, Sultan Chand & Sons,
NewDelhi.

2.Hogg R.V. & Craig A.T. (1988) : Introduction to Mathematical Statistics, McMillan.

3. Mood A.M. &Graybill F.A. & Boes D.G. (1974): Introduction to theory of Statistics, McGraw
Hill.

4.Snedecor G.W. & Cochran W.G(1967) : Statistical Methods, Oxford and IBH.

**e-Resources:**

1. https://nptel.ac.in

2. https://www.wikipedia.org.

3. http://ebooks.lpude.in.statistics.

**COURSE OUTCOME**

**CO1:** Understand the concepts of Sample space and Probability.
**CO2:** Describe the concepts of random variable and Moment generating function.
**CO3:** Calculate Characteristic function of random variables.
**CO4:** Explain the concept of bivariate distribution and solve the problems based on it.
**CO5:** Learn standard distributions and their inter relationship

**Subject Name: Transform Techniques**                                    **Year: II**
**Subject Code: SM24A**                                                        **Semester: IV**


### UNIT I

The Laplace Transforms-Definitions-Sufficient conditions for the existence of the Laplace transform(without proof)-Laplace transform of periodic functions-some general theorems-evaluation of integrals using Laplace transform-Problems. Chapter 5: Section-1 to 5.

### UNIT II

The inverse Laplace Transforms- Applications of Laplace Transforms to ordinary differential equations with constant co-efficients and variable co-efficients, simultaneous equations and equations involving integrals-Problems. Chapter 5: Section-6 to 12.

### UNIT III

Fourier series- Expansion of periodic functions of period $2\pi$- Expansion of even and odd functions, Half range Fourier series-Change of intervals –Problems. Chapter 6: Section-1 to 6.

### UNIT IV

Fourier Transform- Infinite Fourier Transform(Complex form) – Properties of Fourier Transform – Fourier cosine and Fourier sine Tranform – Properties – Parseval"s identity – Convolution theorem - Problems. Chapter 6: Section-8 to 15.

### UNIT V

Z Transforms: Definitionof Z-Transform and its properties - Z-Transforms of some basic functions- Examples and simple problems.


**Contents and treatment as in**

1. "Calculus-Volume III" – S.Narayananand T.K.ManicavachagamPillai. (Ananda Book

    Depot) ( for Units I to IV)

2. "Engineering Mathematics for Semester III- Third Edition – T.Veerarajan

    ( Tata McGraw- Hill Publishing Company Ltd, New Delhi) ( for Unit-V)

**Reference:**

1. Engineering Mathematics Volume III – P.Kandasamy and others ( S.Chand and Co.)

2.Advanced Engineering Mathematics- Stanley Grossman and William R.Devit.

3.Engineering Mathematics III-A.Singaravelu, Meenakshi Agency, Chenani, 2008

**e-Resources:**

1. http://mathworld.wolfram.com .

2. http://www.sosmath.com.

**COURSE OUTCOME**

**CO1:** Understand & Solve Laplace Transforms of any function.
**CO2:** understand inverse Laplace Transforms and solve problems in ordinary differential and simultaneous equations
**CO3:** Explain the concept of periodic function and solve problems in Fourier series
**CO4:** Evaluate the Fourier transforms and solve problems using properties of Fourier transforms..
**CO5:** Learn Z transforms and its properties and solve problems using Z transforms

**Subject Name: Statics**                                    **Year: II**
**Subject Code: SM24B**                                       **Semester: IV**

### UNIT I

Force- Newton"s laws of motion - resultant of two forces on a particle- Equilibrium of a particle
Chapter 2 - Section 2 .1 , 2.2 ,
Chapter 3 - Section 3.1.

### UNIT II

Forces on a rigid body – moment of a force – general motion of a rigid body- equivalent systems of forces – parallel forces – forces along the sides of a triangle – couples
Chapter 4 - Section 4 .1 to 4.6.

### UNIT III

Resultant of several coplanar forces- equation of the line of action of the resultant- Equilibrium of a rigid body under three coplanar forces – Reduction of coplanar forces into a force and a couple.- problems involving frictional forces
Chapter 4 - Section 4.7 to 4.9,
Chapter 5 - Section 5.1, 5.2.

### UNIT IV

Centre of mass – finding mass centre – a hanging body in equilibrium
Chapter 6 - Section 6.1 to 6.3.

### UNIT V

Hanging strings - equilibrium of a uniform homogeneous string – suspension bridge
Chapter 9 - Section 9.1, 9.2.

Contents and treatment as in "Mechanics" by P. Duraipandian ,LaxmiDuraipandian , MuthamizhJayapragasham, S. Chand and Co limited 2008 .

### Reference:

1.Dynamics – K. ViswanathaNaik and M. S. Kasi, Emerald Publishers.

2.Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers.

3.Mechanics – Walter Grenier.

**e-Resources:**

1. https://www.wikipedia.org/

2. https://physics.info

**COURSE OUTCOME**

**CO1:** Understand Newton's laws of motion, resultant of forces and limiting equilibrium.
**CO2:** Describe the types of forces on a rigid body and calculate moment and couple.
**CO3:** Calculate the resultant of several forces and solve problems in couples.
**CO4:** Evaluate the center of mass of a body and identify the mass centre of a hanging body.
**CO5:** Explain and solve problems in hanging strings, virtual work and suspension bridge.

**Subject Name: Mathematical Statistics II**             Year: II
**Subject Code: SM3AG**                                  Semester: IV


## UNIT I
Sampling Theory – Sampling distributions - concept of standard error – sampling distribution based on Normal distribution : t, chi-square and F distribution.

## UNIT II
Point estimation - concepts of unbiasedness, consistency, efficiency and sufficiency - Cramer Rao inequality - methods of estimation : Maximum likelihood, moments and minimum chi-square and their properties (Statement only).

## UNIT III
Test of Significance- standard error – large sample tests. Exact tests based on Normal, t, chi-square and F distributions with respect to population mean/means, proportion/proportions, variances and correlation co-efficient. Test of independence of attributes based on contingency tables – Goodness of fit based on Chi-square.

## UNIT IV
Analysis of variance: one way, two-way classification – Concepts and problems, interval estimation – confidence intervals for population mean/means, proportion/proportions and variances based on  t, Chi-square and F.

## UNIT V
Tests of hypothesis : Type I and Type II errors – power of test – Neyman Pearson Lemma – Likelihood ratio test – Concepts of most powerful test – Statements and results only - Simple problems.

**Reference:**
1. S.C.Gupta&V.K.Kapoor : Elements of Mathematical Statistics, Sultan Chand & Sons, NewDelhi.
2. Hogg R. V. & Craig A.T. (1988) :  Introduction to Mathematical statistics, Mcmillan.
3. Mood A. M &Graybill F. A &Boes D. G (1974) : Introduction to theory of statistics, Mcgraw Hill.
4. Snedecor G.W. & Cochran W.G : Statistical methods, Oxford and IBH.
5. Hoel P. G. (1971) : Introduction to Mathematical Statistics, Wiley.
6. Wilks S. S : Elementary Statistical Analysis, Oxford and IBH.

**e-Resources:**

1. https://nptel.ac.in

2. https://www.wikipedia.org.

3. http://ebooks.lpude.in.statistics.

## COURSE OUTCOME

**CO1:** Understand sampling distribution and normal distribution and solve problems based on it.
**CO2:** Describe the consistency, efficiency and sufficiency of estimators.
**CO3:** Understand how to test the significance of standard error based on contingency tables.
**CO4:** Evaluate the problems based on analysis of variance.
**CO5:** Describe the concept of hypothesis testing and solve the problem based on it.

**Subject Name: Mathematical Statistics I&II –Practicals**  **Year: II**
**Subject Code: SM3A1**  **Semester: IV**

1. Construction of Univariate and Bivariate frequency distribution with
   samples of size not exceeding 200.
2. Diagrammatic and graphical representation on data and frequency distribution.
3. Cumulative frequency distribution – Ogive curves and Lorenz curves.
4. Measures of Location and dispersion (absolute and relative), skewness and Kurtosis.
5. Numerical problem involving derivation of Marginal and Conditional distributions
   and related measures of moments.
6. Fitting of Binomial, Poisson and Normal distribution and test of goodness of fit.
7. Curve fitting by the method of least squares
   a) $y = ax + b$
   b) $y = ax^2 + bx + c$
   c) $y = ae^{bx}$
   d) $y = ax^b$
8. Computation of Correlation coefficients and Regression lines for raw and
   grouped data – Rank correlation coefficient.
9. Asymptotic and exact test of significance with regard to population
   mean, proportion, variance
   and coefficient of correlation.
10. Test of independence of attributes based on contingency table.
11. Confidence interval based on normal, t, chi – square statistics.

**NOTE:** Use of scientific calculator may be permitted for mathematical statistics practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

**COURSE OUTCOME**

**CO1:** Understand the concepts in diagrammatic and graphical representation of data
   and frequency distribution.
**CO2:** Calculate the Measures of dispersion, skewness and kurtosis.
**CO3:** Evaluate the fitting of Binomial, Poisson and Normal distributions, and
   testing the goodness of fit.
**CO4:** Compute Correlation and Regression lines for raw and grouped data.
**CO5:** Analyze the test of significance for mean, proportion, variance based on normal, t,
   chi- square statistics.

**Subject Name: Environmental Studies Programme**                    **Year**: II

**Subject Code**: ENV4B                                             **Semester**: IV

**UNIT I**: Introduction to Environmental Studies Multidisciplinary nature of environment studies, Scope and importance; concept of sustainability and sustainable development.

**UNIT II**: Ecosystem (2 Lectures) What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem; Food chains, food webs and ecological succession, case studies of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Dessert ecosystem d) Aquatic ecosystem (ponds, stream, lakes, rivers, ocean, estuaries)

**UNIT III**: Natural Resources: Renewable and Non-renewable Resources (6 Lectures) Land resources and land use change: Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over – exploitation of surface and ground water, floods, droughts, conflicts over water(international and inter- state).Energy resources: Renewable and non renewable energy sources use of alternate energy sources, growing energy needs, case studies.

**UNIT IV**: Biodiversity and conservation (8 Lectures)Levels of biological diversity: Genetics, species and ecosystem diversity, Biogeographical zones of India: Biodiversity patters and global biodiversity hot spots. India as a mega-biodiversity nation, Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservations of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological economic, social, ethical, aesthetic and informational value.

**UNIT V**: Environmental pollution (8 Lectures) Environmental pollution: Types, causes, effects and controls: Air, Water, Soil and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies.

**UNIT VI**: Environmental policies & Practices (8 Lectures) Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Air (Prevention & control of pollution) Act, Water Prevention & control of pollution) Act; Wildlife Protection ACT; Forest Conservation Act. International Agreements: Montreal and Kyoto protocols and convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights and human wildlife conflicts in Indian context.

**UNIT VII**: Human Communities and the Environment (7 Lectures) Human population growth, impacts on environment, human health and welfare. Resettlement and rehabilitation of projects affected persons; case studies. Disaster management: floods, Earthquake, cyclone, and landslides. Environmental movements: Chipko, silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental

conservation. Environmental communication and public awareness, case studies e.g. CNG Vehicles in Delhi)

**UNIT VIII**: Field work Visit to an area to document environmental assets: River /Forest / Flora/Fauna etc. Visit to a local polluted site- Urban/Rural/Industrial/Agricultural. Study of common plants, Insects, birds, and basic principles of identification. Study of simple ecosystem Pond, River, Delhi Ridge etc.

**COURSE OUTCOME**

**CO1**: Discuss Scope and importance of EVS.
**CO2**: Create Public Awareness on environmental issues
**CO3**: Explain Structure and functions of ecosystem
**CO4**: Enumerate Renewable and non-renewable natural resources
**CO5**: Describe Biodiversity, environmental pollution, environmental policies and practices.
**CO6**: Explain Link between human communities and the environment

**Subject Name: ALGEBRAIC STRUCTURES-I**　　　　　　　**Year: III**
**Subject Code: SM25A**　　　　　　　　　　　　　　　　**Semester: V**

### UNIT I

Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups-
Lagrange's Theorem- A counting principle.
Chapter 2 Section 2.4 and 2.5.

### UNIT II

Normal subgroups and Quotient group- Homomorphism- Automorphism.
Chapter 2 Section 2.6 to 2.8.

### UNIT III

Cayley's Theorem- Permutation groups.
Chapter 2 Section 2.9 and 2.10.

### UNIT IV

Definition and examples of ring- Some special classes of rings- homomorphism of rings
Ideals and quotient rings- More ideals and quotient rings.
Chapter 3 Section 3.1 to 3.5.

### UNIT V

The field of quotients of an integral domain- Euclidean Rings- The particular Euclidean ring.
Chapter 3 Section 3.6 to 3.8.


**Contents and treatment as in** "Topics in Algebra" – I. N. Herstein, Wiley Eastern Ltd.

**Reference**:
1.Modern Algebra by M.L.Santiago, McGraw Hill Education India pvt Ltd.
2.Modern Algebra by S. Arumugam and others, New Gamma publishing House, Palayamkottai.
3.Modern Algebra by Visvanathan Nayak, Emerald Publishers, Reprint 1992.

**e-Resources**:
1. https://nptel.ac.in
2. http://garsia.math.yorku.ca/~sdenton/algstruct.

**COURSE OUTCOME**

**CO1:** Describe the concepts of groups, subgroups and cyclic groups.
**CO2:** Learn theorems in normal subgroups, quotient groups, homomorphism and automorphism.
**CO3:** Acquire the knowledge about the concepts in Cayley's theorem and solve problems
in the permutation group.
**CO4:** Acquire the knowledge about the concepts of Rings, Ideals and Quotient Rings.
**CO5:** Explain about concepts of the field of quotients of an integral domain and Euclidean rings.

**Subject Name: Real Analysis- I**                                       **Year: III**
**Subject Code:   SM25B**                                            **Semester:V**

## UNIT I
Sets and Function:Sets and elements; Operations on sets; functions; real valued functions; equivalence; countability ; real  numbers; least  upper bounds.
Chapter 1 Section 1.1 to 1.7

## UNIT II
Sequences of Real Numbers:Definition of a sequence and subsequence; limit of a sequence; convergent sequences; divergent sequences; bounded sequences; monotone sequences.
Chapter 2 Section 2.1 to 2.6

## UNIT III
Operations on convergent sequences - operations on divergent sequences - limit superior and limit inferior - Cauchy sequences.
Chapter 2 Section 2.7 to 2.10

## UNIT IV
Series of Real Numbers: Convergence and divergence- series with non-negative terms- alternating series-conditional convergence and absolute convergence-tests for absolute convergence- series whose terms form a non-increasing sequence- the class$I^2$
Chapter 3 Section 3.1 to 3.4, 3.6, 3.7 and 3.10

## UNIT V
Limits and Metric Spaces: Limit of a function on a real line- Metric spaces- Limit in metric spaces. Continuous Function on Metric Spaces: Function continuous at a point on the real line- Reformulation- Function continuous on a metric space.
Chapter 4   Section 4.1 to 4.3,   Chapter 5   Section 5.1 -5.3

 **Contents and Treatment as** in
"Methods of Real Analysis": Richard R.Goldberg (Oxford and IBH publishing Co.)

 **Reference Books:**
1. Principles of Mathematical Analysis by Walter Rudin,ataMcGrawHill.
2. Mathematical AnalysisTom M Apostal,Narosa Publishing House.

 **e-Resources:**
   1. https://mathcs.org/analysis/reals/numseq/sequence.html.
   2. http://www-groups.mcs.st-andrews.ac.uk/~john/analysis/index.html
   3. http://www.phengkimving.com.

**COURSE OUTCOME**

**CO1:** Learn sets and functions, real valued function, equivalence and countability.
**CO2:** Describe sequences, sub sequences and their types.
**CO3:** Explain convergent and divergent sequences, limit superior and inferior, Cauchy sequences
**CO4:** Evaluate absolute and conditional convergent of a series.
**CO5:** Describe Metric space and its functions on a real line.

**Subject Name: Dynamics**                                    **Year: III**
**Subject Code: SM25C**                                       **Semester: V**

## UNIT I
Basic units - velocity - acceleration - coplanar motion
Chapter 1: Sections 1.1 to 1.4

## UNIT II
Work, Energy and power - work - conservative field of force - power - Rectilinear motion under varying Force simple harmonic motion(S.H.M.) - S.H.M. along a horizontal line - S.H.M. along a vertical line
Chapter 11: Section 11.1 to 11.3,  Chapter 12: Section 12.1 to 12.3

## UNIT III
Projectiles - Forces on a projectile - projectile projected on an inclined plane  - Impact - impulse force - impact of sphere - impact of two smooth spheres - impact of a smooth sphere on a plane - oblique impact of two smooth spheres.
Chapter 13:  Sections 13.1 to 13.2, Chapter 14:  Section 14.1, 14.5

## UNIT IV
Circular motion - Conical pendulum - simple pendulum - central orbits - general orbits - central orbits - conic as centered orbit.
Chapter 15: Section 15.1, 15.2, 15.6,   Chapter 16:  Section 16.1 to 16.3

## UNIT V
Moment of inertia - Perpendicular and parallel axes theorem
Chapter 17: Section 17.1, 17.1.1

## Contents and treatment as in

"Mechanics" – P. Duraipandian, LaxmiDuraipandian, Muthamizh Jayapragasham, S. Chand and Co limited 2008.

### Reference Books:
1. Dyanmics- K. ViswanathaNaik and M. S. Kasi, Emerald Publishers.
2. Dynamics- A. V. Dharmapadam, S. Viswanathan Publishers.
3. Mechanics - WalterGrenier.

e-Resources:
1. https://nptel.ac.in
2. https://www.wikipedia.org

**COURSE OUTCOME**

**CO1:** Understand and solve the motion along the vertical line under gravity, inclined plane and connected particles.

**CO2:** Explain the concepts of rectilinear motion and simple harmonic motion along horizontal line and vertical line.

**CO3:** Solve problems relating to forces on a projectile, impact and impulse.

**CO4:** Learn circular motion, simple & conical pendulum and central orbits.

**CO5:** Calculate Moment of Inertia for different sections and two dimensional motion of a rigid body.

**Subject Name: Discrete Mathematics**　　　　　　　　　　　**Year: III**
**Subject Code: SM25D**　　　　　　　　　　　　　　　　　**Semester: V**

## UNIT I
Integers :Set, some basic properties of integers Mathematical induction, divisibility of integers, representation of positive integers.
Chapter 1: Sections 1.1 to 1.5

## UNIT II
Boolean Algebra and it's applications :Boolean algebra, two element Boolean algebra, Disjunctive normal form, Conjunctive normal form.
Chapter 5: Section 5.1 to 5.4

## UNIT III
Application, simplification of circuits, designing of switching circuits, Logical Gates and Combinatorial circuits.
Chapter 5: Section 5.5 to 5.6

## UNIT IV
Recurrence relations and generating functions:Sequence and recurrence relation, Solving recurrence relations by iteration method, Modeling of counting problems by recurrence relations, Linear(difference equations) recurrence relations with constant coefficients, Generating functions, Sum and product of two generating functions, Useful generating functions, Combinatorial problems.
Chapter 6: Section 6.1 to 6.6

## UNIT V

Proportional logic and predicate logic: Proportional logic, adequate system of connectives, transformation of sentences in a Natural language into statement formula, logical validity of arguments, Predicate statements, Negation of a statement obtained by qualification of a predicate, Logical operations on predicates or quantified predicates, Symbolization of sentences by using predicates, Quantifiers and connectives, Logical validity of arguments.
Chapter 8: Section 8.1, 8.5 to 8.8 (Omit Sections 8.2 to 8.4)

**Contents and treatment as in**
Introduction to Discrete Mathematics, 2nd edition, 2002 by  M. K. Sen and B. C. Chakraborty, Books and Allied Private Ltd., Kolkata.

**Reference Books:**
1. Discrete mathematics for computer scientists and mathematicians by J. L. Mertt, Abraham Kendel and T. P. Baker prentice-hall, India.
2. Discrete mathematics for computer scientists by John Trust-Addison Wesley.
3. Elements of Discrete Mathematics, C. L. Liu, New York Mcgraw-Hill, 1977.

**e-resources :**

1. https://brilliant.org/wiki/discrete-mathematics/
2. https://www.tutorialspoint.com/discrete_mathematics/

## COURSE OUTCOME

**CO1:** Learn the basic properties of Integers and solve problems in Mathematical induction.
**CO2:** Describe Boolean algebra and solve problems on disjunctive and conjunctive normal forms.
**CO3:** Learn to design switching circuits and understand logical gates.
**CO4:** Solve recurrence relation by iteration method and generating functions.
**CO5:** Learn and express a logical sentence in terms of predicates, quantifiers and connectives.

**Subject Name: Programming Language 'C' With Practical (THEORY)**     **Year: III**
**Subject Code: SM45A**                                                **Semester:V**

**UNIT I** Introduction - Constants-Variables-Data-types -Operators, Precedence of operators – Managing Input and Output Operations. Chapters : 2,3 and 4.

**UNIT II** Decision making and branching: Simple if, if else, nested if, else if ladder and switch statement – conditional operator – go to statement. Decision making and looping : while, do while and for statement – nested for loops – jumps in loops (continue and break statements). Chapters : 5 and 6.

**UNIT III** Arrays : One dimensional and 2 dimensional arrays – declarations – initialization of arrays. Character Arrays and Strings: Declaration and Initialization of Strings - Reading and Writing strings - Operations on strings - String handling functions. Chapters: 7 and 8

**UNIT IV** Functions : Need for User defined functions- A Multi function Program- Elements of User   defined functions - Function definition , Function Call and Function Declaration – Return Values and their types- Categories of functions – Nesting of Functions- Recursion . Pointers: Understanding Pointers-Accessing address of a variable- Declaration and Initialization of Pointers- Accessing a Variable through its Pointer- Function call by reference - call by value. Chapters : 9 and 11.

**UNIT V** File Management in C : Definition-Opening and Closing a file- Input/ Output operations on  Files- Error Handling during I/O operations. Chapter 12.

**Contents and treatment as in**

"Programming in ANSI C", 7th Edition, 2017, by E. Balagurusamy, McGraw Hill Education India Private Limited.

**ReferenceBooks:**

1. "Programming in C" by Venugopal.

2. "Programming with C" by Gottfied.B.S ,Schaum"s outline series, TMH 2001.

3. "Let us 'C'" by YashvantKanitkar ,BPB Publications.

4. "Programming with C" by R.S.Bichkar,Universities Press (INDIA) Pvt.Ltd

**COURSE OUTCOME**

**CO1:** Learn the basics of programming language in C.
**CO2:** Distinguish between the loops.
**CO3:** Describe the concepts of arrays and string handling functions.
**CO4:** Explain the concepts of functions.
**CO5:** Understand the file concepts.

**Subject Name: Programming Language 'C' With Practical**　　　　　　**Year: III**
**Subject Code: SM451**　　　　　　　　　　　　　　　　　　　　　**Semester:V**

**Practicals:**

Writing 'C' programs for the following:

1. To convert Centigrade to Fahrenheit

2. To find the area, circumference of a circle

3. To convert days into months and days

4. To solve a quadratic equation

5. To find sum of n numbers

6. To find the largest and smallest numbers

7. To generate Pascal's triangle, Floyd's triangle

8. To find the trace of a matrix

9. To add and subtract two matrices

10. To multiply two matrices

11. To generate Fibonacci series using functions

12. To compute factorial of a given number, using functions

13. To add complex numbers using functions

14. To concatenate two strings using string handling functions

15. To check whether the given string is a palindrome or not using string handling functions.

**COURSE OUTCOME**
**CO1**: Describe basic Mathematical function.
**CO2:** Solve the quadratic equation and find largest and smallest number.
**CO3:** Solve the concepts of Pascal's, Floyd's and find the trace of the matrix.
**CO4**: Understand the basics of matrices and Fibonacci using functions.
**CO5**: Understand concepts of functions and string handling functions.

**Subject Name: Value Education**                                    **Year: III**
**Subject Code: VAE5Q**                                              **Semester: V**

**UNIT- I** : Value education – its purpose and significance in the present world – value system – The role of culture and civilization- Holistic living- Balancing the outer and inner Body, Mind and Intellectual level-Duties and responsibilities.

**UNIT- II** : Salient values for life- Truth, Commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity and inclusiveness, Self esteem and self-confidence, punctuality- Time, task and resource management- Problem solving and decision making skills- Interpersonal and Intra personal relationship- Team work- Positive and creative thinking.

**UNIT-III**: Human Rights- Universal declaration of human rights- Human Rights violations National Integration- Peace and non-violence- Dr. APJ Kalam"s ten points for enlightened citizenship- Social Values and Welfare of the citizen- The role of media in value building.

**UNIT- IV**: Environment and Ecological balance- Interdependence of all beings- Living and nonliving. The binding of man and nature - Environment conservation and enrichment

**UNIT-V**: Social Evils- Corruption, Cybercrime, Terrorism- Alcoholism, Drug addiction Dowry Domestic violence- Untouchability- Female infanticide- Atrocities against women How to tackle them.

**Books for Reference :**

1. M.G. Chitakra: Education and Human Values, A.P.H. Publishing Corporation, New Delhi, 2003.
2. Chakravarthy, S.K: Values and ethics for Organizations: Theory and Practice, Oxford University Press, New Delhi, 1999.
3. Satchidananda, M.K: Ethics, Education, Indian Unity and Culture, Ajantha Publications, Delhi, 1991
4. Das, M.S. & Gupta, V.K.: Social Values among Young adults: A changing Scenario, M.D. Publications, New Delhi, 1995.
5. Bandiste, D.D.: Humanist Values: A Source Book, B.R. Publishing Corporation, Delhi, 1999.
6. Ruhela, S.P.: Human Values and education, Sterling Publications, New Delhi, 1986.
7. Kaul, G.N.: Values and Education in Independent Indian, Associated Publishers, Mumbai, 1975.
8. NCERT, Education in Values, New Delhi, 1992.
9. Swami Budhananda (1983) How to Build Character A Primer : Rmakrishna Mission, New Delhi.
10. A Culture Heritage of India (4 Vols.), Bharatiya Vidya Bhuvan, Bombay, (Selected Chapters only)
11. For Life, For the future : Reserves and Remains – UNESCO Publication.
12. Values, A Vedanta Kesari Presentation, Sri Ramakrishna Math, Chennai, 1996.
13. Swami Vivekananda, Youth and Modern India, Ramakrishna Mission, Chennai.
14. Swami Vivekananda, Call to the Youth for Nation Building, Advaita Ashrama, Calcutta.

15. Awakening Indians to India, Chinmayananda Mission, 2003.


 **COURSE OUTCOME**

**CO1**: Discuss Self-esteem, ego, anger manifestation, Indian ethos in ethics and individuals personality in the eyes of others
**CO2**: Describe Leadership, ethical business decisions, basic principles of professional ethics and mass media ethics.
**CO3**: Explain Effects of advertising, value of faith, social awareness and commitment and the steps for the protection of environment
**CO4**: Analyse Impact of globalization and consumer awareness, signs for an everlasting peace, evolution of human rights and the international law in operation
**CO5**: Discuss Intellectual activities and responsibility of citizen

**Subject Name: ALGEBRAIC STRUCTURES-II**     **Year: III**
**Subject Code:**               **Semester: VI**

**UNIT I**
Vector spaces. Elementary basic concepts- linear independence and bases
Chapter 4 Section 4.1 and 4.2.

**UNIT II**
Dual spaces
Chapter 4 Section 4.3.

**UNIT III**
Inner product spaces.
Chapter 4 Section 4.4.

**UNIT IV**
Algebra of linear transformations- characteristic roots.
Chapter 6 Section 6.1 and 6.2.

**UNIT V**
Matrices- canonical forms- triangular forms.
Chapter 6 Section 6.3 and 6.4.

**Content and Treatment as in** "Topics in Algebra" – I. N. Herstein-Wiley Eastern Ltd.

**Reference:**
1. University Algebra – N. S. Gopalakrishnan – New Age International Publications, Wiley Eastern Ltd.
2. First course in Algebra – John B. Fraleigh, Addison Wesley.
3. Text Book of Algebra – R. Balakrishna and N. Ramabadran, Vikas publishing Co.
4. Algebra – S. Arumugam, New Gamma publishing house, Palayamkottai.

**e-Resources:**
1. https://nptel.ac.in.
2. http://ebooks.lpude.in.linearalgebra.

**COURSE OUTCOME**

**CO1:** Acquire the knowledge about the concepts of vector space, linear independence and basis.
**CO2:** Describe the concepts of dual spaces.
**CO3:** Describe the concepts of inner product spaces.
**CO4:** Illustrate linear transformation and characteristic roots
**CO5:** Acquire the knowledge about the concepts of Matrices, Canonical & Triangular form.

**Subject Name: Real Analysis- II**                                **Year:III**
**Subject Code:**                                                **Semester:VI**

## UNIT I
Continuous Functions on Metric Spaces:Open sets- closed sets- Discontinuous function of
$R^1$. Connectedness, Completeness and Compactness :More about open sets- Connected sets.
Chapter 5 Section 5.4 to 5.6
Chapter 6 Section 6.1 and 6.2

## UNIT II
Bounded sets and totally bounded sets: Complete metric spaces-compact metric spaces,
continuous functions on a compact metric space, continuity of inverse functions, uniform
continuity.
Chapter 6 Section 6.3 to 6.8

## UNIT III
Calculus:Sets of measure zero, definition of the Riemann integral, existence of the Riemann
integral; properties of Riemann integral
Chapter 7 Section 7.1 to 7.4

## UNIT IV
Derivatives- Rolle 's Theorem, Law of mean, Fundamental theorems of calculus.
Chapter 7  Section 7.5 to 7.8

## UNIT V
Taylor's theorem- Pointwise convergence of sequences of functions, uniform convergence of
sequences of functions
Chapter 8- Section 8.5, Chapter 9 - Section 9.1 and 9.2

**Contents and Treatment as in**
"Methods of Real Analysis" – Richard R. Goldberg (Oxford and  IBH Publishing Co.)

**Reference Books:**
1. Principles of Mathematical Analysis by Walter Rudin,TataMcGrawHill.
2. Mathematical Analysis Tom M Apostal,Narosa Publishing House.

**e-Resources:**
   1. https://nptel.ac.in.
   2. https://mathonline.wikidot.com.
   3. https://en.wikipedia.org/wiki/Metric_space.
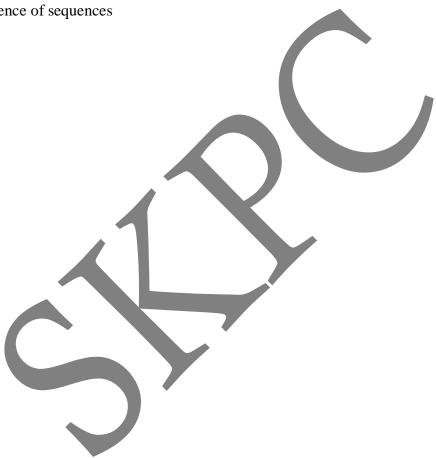
## COURSE OUTCOME

**CO1:** Understand the concepts of open, closed & connected sets.
**CO2:** Explain the concepts of boundedness, completeness and compactness of metric space.
**CO3:** Describe the concepts of sets of measure zero, Riemann Integral and its existence.
**CO4:** Explain and solve the problems on Rolle's theorem, law of Mean and
   fundamental theorems of calculus.
**CO5:** Understand Taylor's theorem and evaluate pointwise and uniform
   convergence of sequences

**Subject Name: Complex Analysis**                                    **Year: III**
**Subject Code:**                                                     **Semester:VI**

## UNIT I

Analytic Functions:Functions of a Complex Variable – Limit- Theorems on Limits – Continuous functions- Differentiability – Cauchy – Riemann equations – Analytic functions- Harmonic functions – Conformal mapping.
Chapter 1 – sec 2.1 to 2.9.

## UNIT II

Bilinear Transformations:Elementary transformations – Bilinear transformations – Cross ratio- Fixed Points of Bilinear Transformations – Mapping by Elementary Functions -   The Mapping $w = z^2$, $z^n$, n is a positive integer,$w = e^z$, sin z, cos z.
Chapter 3 – sec 3.1 to 3.4 , Chapter 5 – sec 5.1 to 5.5

## UNIT III

Complex Integration – definite integral – Cauchy's Theorem – Cauchy's integral formula – Higher derivatives.
Chapter 6 – sec 6.1 to 6.4

## UNIT IV

Series expansions – Taylor's series – Laurent's Series – Zeros of analytic functions- Singularities.
**Chapter 7 – 7.1 to 7.4**

## UNIT V

Residues – Cauchy's Residue Theorem – Evaluation of definite
integrals. Chapter 8 – 8.1 to 8.3.

**Contents and Treatment as in**

"Complex Analysis"  byDr.S.Arumugam,Thangapandi Isaac, Dr.A.Somasundaram, SciTech publications(India) Pvt Ltd,2002.

**Reference Books:**

**1.** Complex variables and Applications (Sixth Edition) by James Ward   Brown and RuelV.Churchill, Mc. Grawhill Inc.

2.  Complex Analysis by P.Duraipandian,KayalakPachaiyappa,S.Chand& Co Pvt.Ltd.

3.  Complex Analysis ,T.K.Manickavachagom Pillay, S.Viswanathan Publishers Pvt. Ltd.

**e-Resources:**

1. [http://ebooks.lpude.in.complexanalysis](http://ebooks.lpude.in.complexanalysis).

2. [https://nptel.ac.in](https://nptel.ac.in).

## COURSE OUTCOME

**CO1:** Decide when and where a given function is analytic and harmonic and able to find it series development.

**CO2:** Understand Bilinear transformations and their fixed point.

**CO3:** Describe the concepts of Cauchy's Theorem and Cauchy's integral formula.

**CO4:** Understand Taylor's series and Laurent's Series and evaluate

Zeros of analytic function and Singularities.

**CO5:** Illustrate Cauchy's Residue Theorem and Evaluation of definite integrals.

**Subject Name: Graph Theory**                                                                  **Year:III**
**Subject Code:**                                                                                     **Semester:VI**

## UNIT I
Graphs and Subgraphs:Introduction - Definition and Examples, degrees, subgraphs, isomorphism, independent sets and coverings, intersection graphs and line graphs, matrices, operations on graphs.
Chapter 2: Section 2.0 - 2.9 (omit section 2.5)

## UNIT II
Degree sequences and Connectedness: Degree sequences and graphic sequences – simple problems. Walks, trails, paths, connectedness and components, blocks, connectivity – simple problems.
Chapter 3 Sections 3.0 – 3.2 , Chapter 4 Sections 4.0 – 4.4

## UNIT III
Eulerian and Hamiltonian graphs
Chapter 5: Section 5.0-5.2

## UNIT IV
Trees : Characterisation of Trees, Centre of a Tree -simple problems.
Planarity : Definition and properties, characterization of planar graphs.
Chapter 6 Sections 6.0 – 6.2 , Chapter 8 Sections 8.0 – 8.2

## UNIT V
Directed Graphs: Definition and basic properties, paths and connections, digraphs and matrices, tournaments .
Chapter 10 Sections 10.0 – 10.4

### Content and treatment as in
"Invitation to Graph Theory", by S.Arumugam and S.Ramachandran, Scitech Publications (India) Pvt. Ltd., Chennai 17.

### Reference Books:
1. A first book at graph theory by John Clark and Derek Allan Holton, Allied Publishers.
2. Graph Theory byS.Kumaravelu and SusheelaKumaravelu, Publishers authors C/o 182
   Chidambara Nagar,Nagarkoil.

### e-Resources:
1. https://nptel.ac.in.
2. https://mathonline.wikidot.com .
3. http://ebooks.lpude.in.graphtheory.

**COURSE OUTCOME**

**CO1:** Learn the concepts of operations on graphs.
**CO2:** Identify the connectedness, Walks, trails, paths, components, bridge and block in graphs.
**CO3:** Identify Eulerian and Hamiltonian graphs.
**CO4:** Learn the concepts of planarity of graphs and solve problems on trees.
**CO5:** Explain the concepts of the digraphs, matrices and tournaments of a graph.

**Subject Name: Operations Research**                    **Year: III**
**Subject Code:**                                        **Semester: VI**

**UNIT I**
Linear programming: Formulation – graphical solution. Simplex method, Big-M method, Duality – primal – dual relation.
Chapter 6: Section 6.1-6.13, 6.20-6.31

**UNIT II**
Transportation problem: Mathematical Formulation. Basic Feasible solution. North West Corner rule. Least Cost Method, Vogel"s approximation. Optimal solution.Unbalanced Transportation problems. Degeneracy in Transportation Problems.
Assignment problem: Mathematical Formulation. Comparison with
Transportation Model .Hungarian Method. Unbalanced Assignment problems
Chapter 9: Section 9.1-9.12,        Chapter 8: Sections 8.1-8.5

**UNIT III**
Sequencing problem: n jobs on 2 machines – n jobs on 3 machines – two jobs on m machines – n jobs on m machines.Game theory: Two – person zero sum game with saddle point – without saddle point  - dominance  - solving 2xn or mx2 game by graphical method.
Chapter 10: Sections 10.1-10.6,  Chapter 12: Section 12.1-12.15

**UNIT IV**
Queuing theory: Basic concepts. Steady state analysis of M/M/1 and M/M/S models with finite and infinite capacities.
Chapter 5: Section 5.1 – 5.18

**UNIT V**
Network: Project Network diagram-CPM and PERT computations.( Crashing excluded)
Chapter 13: Sections 13.1-13.10

**Content and treatment as in**
Operations Research by R.K.Gupta, Krishna
Prakashan India (p), Meerut Publications.

**Reference Books**:
1. Gauss S. I. Linear programming, McGraw-Hill Book Company.
2. Gupta P. K. and Hira D. S., problems in Operation research, S.Chand& Co.
3. Kami Swaroop, Gupta P.K. and Manmohan, problems in Operation
   Research, Sultan Chand   & Sons.
4. Ravindran A., Philips D.T. and Solberg J.J., Operations Research, John wiley& Sons.
5. Taha H.A., Operation Research, Macmillan pub.Company, New York.

6. Linear Programming, Transportation, Assignment Game by Dr.Paria, Books and Allied(p) Ltd.,1999
7. V.Sundaresan, K.S.Ganapathy Subramanian and K.Ganesan, Resource Management Techniques. A.R.Publication.

**e resources :**
1.http://ebooks.lpude.in.operationsresearch/
2.https://ocw.mit.edu/

## COURSE OUTCOME

**CO1:** Understand and solve linear programming problem using graphical and simplex methods.
**CO2:** Obtain the optimal solution for Transportation and Assignment problems.
**CO3:** Describe and solve problems on Game theory and Sequencing problem.
**CO4:** Understand and solve the problems of Queuing theory.
**CO5:** Design a project network and solve problems based on CPM and PERT.