**SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE**

**(Autonomous)**

**[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]**

**[Accredited by NAAC with 'A' Grade with CGPA of 3.27]**

**[Recognized 2(f) & 12(B) Status under UGC Act of 1956]**

**Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)**

**Tamil Nadu, India**

**Website:www.svmcugi.com  Email:svm.maths.ug@gmail.com**

**DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**REGULATIONS AND SYLLABUS FOR**

**B.Sc. MATHEMATICS PROGRAMME**

**(SEMESTER PATTERN)**

**(For Students Admitted in the College from the  Academic Year 2020-2021 Onwards)**

## Programme Outcomes (POs)

| PO1 | **Communicate Effectively** - Well versed in communicating both in English (as medium of instruction) and Tamil (mother's tongue), distinguish between professional and non-professional dialogues. Develop LSRW (Listening, Speaking, Reading, Writing) skills with advanced technologies. |
|------|------|
| PO2 | **Environment Concern** - Follow RRRR (Reduce, Reuse, Recycle, Refuse) and develop affinity towards environment and practice save Nature and Water. |
| PO3 | **Ethical and Healthy Practice** - Adhere to values in day to day life, practice yoga and other physical exercises, hence, develop self - respect and self-esteem, have strong integrity. |
| PO4 | **Social Consciousness** - Understand the rural situations through ERP (Empowering Rural People), and develop social consciousness, solve the issues through interaction, become mediator/ moderator between government and people, and become true citizen of our Nation. |
| PO5 | **Subject Specialist** - Acquaint their own subject and integrate with other disciplines (CBCS) with advanced technologies and become a Regional, National and Global competitor. |

## Programme Specific Outcomes (PSOs)

| PSO1 | Students will develop and apply concepts of expressions, equations and inequalities to investigate and describe. |
|------|------|
| PSO2 | Real Numbers and Algebraic Expressions. Classify and Define Properties of Real Numbers. Solve Multi-Step Linear Equations. Problem Solving. |
| PSO3 | Simplify and perform arithmetic operations on rational algebraic expressions, including those with radicals and perform the basic arithmetic operations of addition, subtraction, multiplication and division on polynomials. |
| PSO4 | Demonstrate an understanding of limits and how they are used in sequences, |

| | |
|---|---|
| | series, differentiation and integration. |
| **PSO5** | The course includes axioms of real number systems, uniform convergence of sequences and series of functions, equi-continuity. |
| **PSO6** | Formulate and solve problems as networks and graphs. Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems. Use CPM and PERT techniques, to plan, Schedule and control project activities. |
| **PSO7** | Complex numbers, analytic functions, Cauchy integral theorem, Cauchy integral formula, power series and conformal mapping. |
| **PSO8** | Fluid, solid or continuum mechanics. You have good knowledge of a broad range of methods and techniques based on mechanics and can use them for analysis and problem solving. |
| **PSO9** | Correlation and Regression analysis, Multiple Regression and Statistical Forecasting. |
| **PSO10** | Analyze vector functions to find derivatives, tangent lines, integrals, arc length, and curvature, Differentiate vector fields, Determine gradient vector fields and find potential functions, Evaluate line integrals directly and by the fundamental theorem. |
| **PSO11** | To appreciate the basic principles of Boolean algebra, Logic, Set Theory, Permutations. |

# SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE
## (Autonomous)
## Bachelor of Science (B.Sc.) in Mathematics
## Programme Pattern and Syllabus (CBCS)

**(For Students Admitted in the College from the Academic Year 2020-2021 Onwards)**

| Sl. No. | Part | Nature of Course | Course Code | Name of the Course | Hours/ Week | Credits | Marks CIA | ESE | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **CIA** | **ESE** | **Total** |
| | | | | **SEMESTER I** | | | | | |
| 1 | I | Language | 20UTA1F01 | Tamil – I | 5 | 3 | 25 | 75 | 100 |
| 2 | II | Language | 20UEN1F01 | English – I | 5 | 3 | 25 | 75 | 100 |
| 3 | | Core – I | 20UMA1C01 | Algebra and Trigonometry | 5 | 4 | 25 | 75 | 100 |
| 4 | | Core –II | 20UMA1C02 | Logic, sets and Boolean Algebra | 6 | 5 | 25 | 75 | 100 |
| 5 | III | Allied – I | 20UPH1A01 | Allied Physics – I | 5 | 4 | 25 | 75 | 100 |
| 6 | | Allied Practical – I Extended to Semester II | 20UPH1AP01 | Allied Physics Practical – I | 2 | Credit and marks are carried to Allied Practical – I of Semester II | | | |
| 7 | IV | Value Education | 20UVE101 | Yoga | 2 | 2 | 25 | 75 | 100 |
| | | **Total** | | | **30** | **21** | **150** | **450** | **600** |
| | | | | **SEMESTER II** | | | | | |
| 8 | I | Language | 20UTA2F02 | Tamil – II | 5 | 3 | 25 | 75 | 100 |
| 9 | II | Language | 20UEN2F02 | English – II | 5 | 3 | 25 | 75 | 100 |
| 10 | | Core – III | 20UMA2C03 | Intergral and Vector Calculus | 5 | 5 | 25 | 75 | 100 |
| 11 | | Core – IV | 20UMA2C04 | Differential Equations | 6 | 5 | 25 | 75 | 100 |
| 12 | III | Allied – II | 20UPH2A02 | Allied Physics– II | 5 | 3 | 25 | 75 | 100 |
| 13 | | Allied Practical – I Extended from | 20UPH2AP01 | Allied Physics Practical – I | 2 | 3 | 40 | 60 | 100 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Semester I | | | | | | | |
| 15 | | Common Paper | 20UES201 | Environmental Studies | 2 | 2 | 25 | 75 | 100 |
| **Total** | | | | | **30** | **24** | **190** | **510** | **700** |

| | | | | **SEMESTER III** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | I | Language | 20UTA3F03 | Tamil – III | 5 | 3 | 25 | 75 | 100 |
| 17 | II | Language | 20UEN3F03 | English – III | 5 | 3 | 25 | 75 | 100 |
| 18 | | Core – V | 20UMA3C05 | Real analysis-I | 6 | 5 | 25 | 75 | 100 |
| 19 | | Core – VI | 20UMA3C06 | Mechanics | 5 | 4 | 25 | 75 | 100 |
| 20 | | Allied – III | 20UCH3A01 | Allied Chemistry – II | 5 | 4 | 25 | 75 | 100 |
| 21 | III | Allied Practical– II Extended to Semester IV | 20UCH3AP01 | Allied Chemistry Practical – II | 2 | Credit and marks are carried to Allied Practical – II of Semester IV | | | | |
| 23 | | NMEC-II | 20UCS3N01 | Non-Major Elective – I | 2 | 2 | 25 | 75 | 100 |
| **Total** | | | | | **30** | **21** | **150** | **450** | **600** |

| | | | | **SEMESTER IV** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 24 | I | Language | 20UTA4F04 | Tamil – IV | 5 | 3 | 25 | 75 | 100 |
| 25 | II | Language | 20UEN4F04 | English – IV | 5 | 3 | 25 | 75 | 100 |
| 26 | | Core – VII | 20UMA4C07 | Real Analysis-II | 6 | 5 | 25 | 75 | 100 |
| | | Core – VIII | 20UMA4C08 | Graph theory | 5 | 5 | 25 | 75 | 100 |
| 27 | III | Allied – IV | 20UCH4A02 | Allied Chemistry – II | 5 | 3 | 25 | 75 | 100 |
| 29 | | Allied Practical– II Extended from Semester IV | 20UCH4AP01 | Allied Chemistry Practical – I | 2 | 3 | 40 | 60 | 100 |
| 30 | IV | NMEC-II | 20UCS4N02 | Non-Major Elective – II | 2 | 2 | 25 | 75 | 100 |
| **Total** | | | | | **30** | **24** | **190** | **510** | **700** |

| | | | | **SEMESTER V** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 32 | | Core Course | 20UMA5C09 | Abstract | 5 | 5 | 25 | 75 | 100 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | – IX | | Algebra | | | | |
| 33 | III | Core Course – X | 20UMA5C10 | Complex Analysis – 1 | 6 | 5 | 25 | 75 | 100 |
| 34 | | Core Course – XI | 20UMA5C11 | Mathematical Statistics – I | 5 | 5 | 25 | 75 | 100 |
| 36 | | Group A Elective – I | | From Group A | 5 | 4 | 25 | 75 | 100 |
| 37 | | Group B Elective – II | | From Group B | 5 | 4 | 25 | 75 | 100 |
| 38 | IV | SBEC – I | 20UMA5S01 | C-Programming | 2 | 2 | 25 | 75 | 100 |
| 39 | | SBEC – II | 20UMA5SP01 | C-Programming Practical | 2 | 2 | 40 | 60 | 100 |
| **Total** | | | | | **30** | **27** | **190** | **510** | **700** |
| **SEMESTER VI** | | | | | | | | | |
| 40 | | Core Course – XII | 20UMA6C12 | Linear Algebra | 6 | 5 | 25 | 75 | 100 |
| 41 | | Core Course – XIII | 20UMA6C13 | Complex Analysis – II | 6 | 5 | 25 | 75 | 100 |
| 44 | | Core Course – XIV | 20UMA6C14 | Mathematical Statistics – II | 6 | 4 | 25 | 75 | 100 |
| 45 | III | Group C Elective – III | 20UCS6E03 | From Group C | 6 | 4 | 25 | 75 | 100 |
| 46 | IV | SBEC – III | 20UMA6S03 | Quantitative Aptitude | 4 | 2 | 25 | 75 | 100 |
| 47 | | SBEC – IV | 20UMA6SP02 | R Programming (Statistics) Pratical | 2 | 2 | 40 | 60 | 100 |
| | | | 20UEX601 | Extension Activity | * | 1 | * | * | * |
| **Total** | | | | | **30** | **23** | **165** | **435** | **600** |
| **Grand Total** | | | | | **180** | **140** | **1035** | **2865** | **3900** |

CBCS          – Choice Based Credit system

CIA           – Continuous Internal Assessment

ESE           – End of Semester Examinations

SWAYAM    –Study Webs of Active-Learning for Young Aspiring Minds

NPTEL       –National Programme on Technology Enhanced Learning

**Major Elective Courses**

| List of Elective Papers (Can Choose Any One for V & VI Semester) | | | | Page |
|---|---|---|---|---|
| Group A | 20UMA5E01 | Elective - I | Operations Research | 47 |
| | 20UMA5E02 | Elective - I | Number Theory | 50 |
| Group B | 20UMA5E03 | Elective - II | Numerical Methods | 52 |
| | 20UMA5E04 | Elective - II | Combinatorial Mathematics | 55 |
| Group C | 20UMA6E05 | Elective - III | Astronomy | 71 |
| | 20UMA6E06 | Elective - III | Analytical Geometry of 2-D and 3-D | 73 |

**Non-Major Elective Courses**

1.  Communication English

2.  Basic Computer Applications

**Skill Based Elective Courses**

1. C-Programming

2. C-Programming Practical

3. Quantitative Aptitude

## List of Extension Activities

1. National Cade Corps (NCC)

2. National Service Scheme (NSS)

3. Youth Red Cross (YRC)

4. Physical Education (PYE)

5. Eco Club (ECC)

6. Red Ribbon Club (RRC)

7. Women Empowerment Cell (WEC)

# PROGRAMME SYLLABUS

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – I** | | **Course Code:**20UMA1C01 | | **Course Title**: Algebra and Trigonometry |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| I | 5 | 75 | 4 | 100 |

## Course Objectives

1. In this course students are exposed to topics like Matrices, Theory of equation,Reciprocal equations, Expansions of terms, and Hyperbolic, Inverse hyperbolic.

2.The stress is on the development of problems solving skills.

**Unit  I: Matrices**

Characteristic equation – Characteristic roots and Characteristic vectors – properties – problems - Cayley – Hamilton theorem (statement only) and its problems –Diagonalisation of Matrices – problems.(Chapter 6, Page: 6.50-6.82).

**Unit II: Theory of equation**

Relation between roots and coefficients of equations –Imaginary and irrational roots-Symmetric functions of roots in terms of coefficients of third degree equation – problems. (Chapter 7, Page: 7.1-7.30).

**Unit III: Reciprocal equations**

Reciprocal equations- Transformation of equations – Roots with sign changed – Roots multiplied by a given number – problems. Diminishing the roots of an equations– Removal of terms– Descartes' rule of signs–Horner's Method–Newton Method of evaluating a real root correct to given decimal places-problems (Chapter 7, Page:7.30-7.67).

**Unit IV:Expansions of terms**

Expansions of sinnθ, cosnθ and tannθ – Expansions of $sin^n\theta$ , $cos^n\theta$ interms of multiples angles of θ -Expansions of sinθ , cosθ  in ascending power of θ-problems.(Chapter 11, page: 11.1-11.27).

**Unit V:Hyperbolic and Inverse hyperbolic function**

Hyperbolic Function and its properties –Relation between circular and hyperbolic functions - Inverse hyperbolic function problems (Chapter 11, Page: 11.31-11.56).

**Text Book**

1. Dr.P.R.Vittal and V.Malini, Algebra Analytical Geometry and Trigonometry, Margham Publications, Chennai – 17,Third Edition 2000.

**Reference Books**

1.T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapathy, Algebra Volume I – S.Viswanathan Printers and Publishers Pvt. Ltd., 2004.

2.A. Singaravelu and R.Ramaa, Algebra and Trignometry –I,Meenakshi Agency,Chennai, June 2003

3.P.Duraipandian, Dr. S.Udayabaskaran, Allied Maths Volume –1, Muhil Publishers Chennai – 28, Reprint 1999.

4.S.Narayanan, T.K.Manicavachagam Pillay, Trigonometry,Publisher: Viswanathan , S.,Printers&Publishers Pvt. Ltd., 2004 Edition.

**E-Learning Source**

http://www.sosmath.com

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Study the concept of Matrices and Cayley- Hamilton theorem. | K1 |
| CO2 | Finding the solution of Theory of equations. | K2 |
| CO3 | Study the concept of Reciprocal Equations | K2& K3 |
| CO4 | Evaluate Expansions of cos nθ and sin nθ. | K4&K5 |
| CO5 | Obtain the solution of Hyperbolic functions and Inverse hyperbolic functions. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong**  **M – Medium**  **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – II** | | **Course Code:**20UMA1C02 | **Course Title**: Logic, sets and Boolean Algebra | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| I | 6 | 90 | 5 | 100 |

## Course Objectives

To extend student's Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.Gain knowledge about the concept of Mathematical logic and algebraic structures.Know about Boolean algebra and its application to Sequential Machines.Make them to use in practical applications related to computer science.

## UNIT  I:Mathematical logic

Connectives: Negation – Conjunction – Disjunction – Statement formulas and Truth table – Conditional and Bi-conditional – Well- formed formulas-Tautologies. (Chapter 1: Sections 1.2.1 to 1.2.4, 1.2.6 to 1.2.8, Page No.: 7-14 & 18-26).

## UNIT II:Mathematical logic (Continued)

Normal forms: Disjunctive Normal forms – Conjunctive Normal forms – Principal Disjunctive Normal forms – Principal conjunctive normal forms. (Chapter 1: Sections 1.3.1 to 1.3.4, Page No.: 50-58).The theory of inference for the statement calculus: Validity using truth tables – Rules of inference – Consistency of premises and indirect method of proof. (Chapter 1: Sections 1.4.1 to 1.4.3, Page No.: 65-73).

## UNIT  III:Mathematical logic (Continued)

The predicate calculus: Predicates – The Statements function, Variables and quantifiers – Predicate formulas – Free and bound variables – The universe of discourse. (Chapter 1: Sections 1.5.1 to 1.5.5, Page No.: 79-89).Inference theory of the predicate calculus: Valid formulas and Equivalences – Some valid formulas over finite Universes – Special valid formulas involving quantifiers – Theory of inference for the predicate calculus. (Chapter 1: Sections 1.6.1 to 1.6.4, Page No.: 90-99).

## UNIT IV: Set Theory

Relations and ordering: Relations – Properties of binary relation in a set– Functions– Definition and introduction – Composition of functions – inverse functions– Natural numbers– Peano axioms and Mathematical Induction. (Chapter 2: Sections 2.3.1-2.3.2 and 2.4.1-2.4.3 and 2.5.1, Page No.: 148-155, 192-203 and 220-224).

## UNIT V: Lattices and Boolean algebra

Lattices as partially ordered sets: Definition and Examples – Some properties of Lattices– Boolean algebra–Definition and example – Sub algebra, Direct Product and homomorphism – Boolean Functions – Boolean forms and free Boolean algebra – values of Boolean expression and Boolean functions. (Chapter 4: Sections 4.1.1-4.1.2, 4.2.1-4.2.2 and 4.3.2, Page No.: 378-384, 397-403 and 406-416).

**Text Book**

1. J.P. Trembly, R. Manohar, Discrete Mathematical Structure with Applications to Computer Science, Tata McGraw Hill, 2001.

**Reference Books**

1. Prof. V. Sundaresan, K. S. Ganapathy Subramaniyan, K. Ganesan, Discrete Mathematics, Tata Mc Graw Hill, New Delhi, 2000.

2. L. Lovarz, J. Pelikan, K. Vexztergombi, Discrete Mathematics, Springer International Edition, 2002.

3. N. Chandrasekaran M. Uma parvathi, Discrete Mathematics, PHI Learning P. Ltd. 2010.

4. Dr. M.K. Sen and Dr. B.C. Charraborthy, Introduction to Discrete Mathematics,Arunabha Sen Books & Allied Pvt. Ltd., 8/1 Chintamoni Das Lane, Kolkata – 700009, Reprinted in 2016.

**E–Learning Sources**

1.https://ocw.mit.edu/courses/electrical-engineering-andcomputer-science/6-042j-mathematics-for-computer-science-fall-2005

2. www.crectirupati.com>default>files

3. www.mafy.lut.fi>Lectures>Lecture2

4. Faculty.atu.edu>mfinan>main2

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Understand Logic and properties. | K1 |
| CO2 | Derived Normal forms and The theory of inference for the statement calculus. | K1&K2 |
| CO3 | Describe The predicate calculus and Inference theory of the predicate calculus. | K2& K3 |
| CO4 | Define and illustrate the Relations and ordering. | K4&K5 |
| CO5 | Describe Lattices as partially ordered sets. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | M | S | S | S | S |
| CO4 | M | S | S | S | S |
| CO5 | M | S | S | S | S |

**S – Strong                     M – Medium                     L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – III** | | **Course Code:**20UMA2C03 | **Course Title**: Integral and Vector Calculus | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| II | 5 | 75 | 5 | 100 |

### Course Objectives

To develop problem solving skills in Calculus and provide base for higher Mathematics and to develop deep understanding of key concepts followed by problems of applied mathematics, which are essential, tools of modern applied mathematics.

### UNIT I:Curvature and Radius of Curvature

Curvature and radius of curvature –  Definitions, Cartesian formula for radius curvature, Parametric formula for radius of curvature - Radius of curvature in polar co-ordinates, Radius of curvature for pedal curves, Radius of Curvature for polar tangential curves – problems.(Chapter 6: Page No.: 6.1-6.19, 6.22-6.32).

### UNIT II:Reduction Formula

Bernoulli's formula for integration by parts, Reduction formulae – Problems.(Chapter 11: Page No.: 11.1-11.32).

### UNIT III:Beta, Gamma Functions

Beta and Gamma functions, Properties, Relation between Beta and Gamma functions, Evaluations of definite integrals using Beta and Gamma functions – Problems. (Chapter 13: Page No.: 13.1-13.27)

### UNIT IV:Vector Integration

Vector integration – Line integral – Application of line integral-Surface and Volume integrals – Problems.  (Chapter 2: Page No.: 59-89).

### UNIT V:Vector Integration (Continuation)

Gauss Divergence theorem -Stoke's theorem – Green's theorem in plane– Problems. (Chapter 2: Page No.: 89-106, 108-126, 129-140).

### Text Books

1. P.R. Vittal and V. Malini, Calculus, Margham Publications, Chennai, 2012 (for UNIT I, II, III).

2. P.R. Vittal and V. Malini, Vector Analysis, Margham Publications, Chennai, 2006 (for UNIT IV, V).

**Reference Books**

1. S.Narayanan, T.K.Manicavachagam Pillay, Trigonometry, Publisher: Viswanathan , S.,Printers&Publishers Pvt. Ltd, 2004

2.T.K.Manicavasagam Pillai, Natarajan and Ganapathy, Algebra Vol.1 Publisher: Viswanathan , S.,Printers&Publishers Pvt. Ltd, 2004

3. P. Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Chennai, Reprint 2003.

**E-learning Sources**

1. https://online.math.uh.edu/HoustonACT/videocalculus/

2.http.www.math.hmoedu/calculus/tutorials/vector analysis/

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Find the Curvature and radius of curvature in polar coordinates. | K1 |
| CO2 | Solving technique of integrals, Integration by parts and Bernoulli's formula. | K2 |
| CO3 | Discuss Beta & Gamma functions. | K2& K3 |
| CO4 | Define a vector differentiation, Find and interpret of vector differential operator, Gradient, Direction and magnitude of gradient. | K4 |
| CO5 | Evaluate Gauss divergence theorem, Stoke's theorem and Green's theorem. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | M | S | S | S | S |
| CO4 | M | S | S | M | S |
| CO5 | S | S | M | S | S |

**S – Strong**            **M – Medium**            **L – Low**

| Program:  B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| **Core – IV** | | **Course Code:**20UMA2C04 | | **Course Title**: Differential Equations | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** | |
| II | 6 | 90 | 5 | 100 | |

## Course Objectives

1. To help the learners to solve standard types of ordinary and partial differential equations.

2. Know about Laplace transforms and its application of differential equations.

**UNIT I:Equations of the First Order and of the First Degree**

Equations of the First Order –Variables Separable – Homogeneous and Non-Homogeneous Equations of the first Degree in x and y – Exact Differential Equations– Integrating factor – Problems only. (Chapter- 2, Section 2.1 to 2.8, Page: 2.1 to 2.74).

**UNIT II:Linear Equations of the Second Order with variable coefficients and Total Differential Equations**

Second order differential Equations with variable co-efficient – Method of variation of parameters – simple problems – Total differential equations - Problems. (Chapter-7, Section 7.1 to 7.11, Page : 7.1 to 7.50 )and (Chapter-8, Section 8.1 to 8.5, Page: 8.1 to 8.22).

**UNIT III:Partial Differential Equations**

Formation of equation by eliminating arbitrary constants and arbitrary functions – Types of Solution of P.D.E – Solutions of first order P.D.E in the standard forms – Lagrange's Linear equation $Pp + Qq = R$ – Solution of the simultaneous Equations. (Chapter-9: Section :9.1 to 9.8, Page :9.1 to 9.62).

**UNIT IV:Laplace Transforms**

Laplace Transforms – Definition – Properties of Laplace transforms– Periodic functions – Laplace transforms of elementary functions – Problems. (Chapter:7 Section :1 to 3, Page :7.1 to 7.23).

**UNIT  V:Inverse Laplace transforms**

Inverse Laplace transforms – Standard formulae – Elementary Theorems – Solving differential Equation using Laplace transforms and Solving Simultaneous linear differential

equations. (Chapter: I Section:1.7 to 1.15, Page :1.21 to 1.56 and Section:1.18 to 1.2, Page :1.65 to 1.88).

**Text Books**

1.Dr.M.K. Venkatraman, Mrs. Manorama Sridhar, Differential Equations and Laplace Transformatins, The National Publishing Company,2010.(UNIT-I,II,III,V).

2.P.R.Vittal [2004], Differential Equations and Laplace Transform, Margham Publications, Chennai, (UNIT-IV).

**Reference Books**

1.S. Narayanan, Differential Equations and Laplace Transformations, Vijay Nicole Imprints Pvt. Ltd., C – 7, Nelson Chambers, 115 Nelson Manickam Road, Chennai – 600 029, 2004.

2. K.Sankar Rao - Introduction to Partial Differential Equations Prentice Hall India – New Delhi, 1997.

3. Dr.J.K. Goyal and K.P.Gupta, Laplace and Fourier Transforms, Pragali Prakashan Publishers, Meerut, 2000.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| **CO1** | Solve the first order differential equations through various techniques. | K1 |
| **CO2** | Learn the methods for solving Linear Differential Equations with constant and variable coefficients. | K2 |
| **CO3** | Evaluate the partial differential equations of first order using different methods. | K3 |
| **CO4** | Understand the basic concepts of Laplace and Inverse Laplace Transforms. | K4 |
| **CO5** | Apply Laplace and Inverse Laplace transforms to solve the ordinary differential equations. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | M |
| CO3 | S | S | M | S | S |
| CO4 | S | S | S | S | S |
| CO5 | M | S | S | S | S |

**S – Strong**          **M – Medium**          **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – V** | | **Course Code:**20UMA3C05 | **Course Title**: Real analysis-I | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| III | 6 | 90 | 5 | 100 |

## Course Objectives

1. To know about the concepts of sequences and series of real numbers.

2. To study about the binomial theorem, Exponential theorem and Logarithmic Series.

**UNIT I:Sequence of real numbers**

Definition – Sequence and subsequence – Limit of a sequence – Convergent sequence – Divergent of sequences – Bounded sequences – Monotone sequences – Operations on convergent sequences(Chapter 2:Section 2.1 - 2.7 pages 24-44).

**UNIT II:Series of real numbers**

Operations on divergent sequences – Limit superior and Limit Inferior – Cauchy sequences – Convergence and Divergence of series – Series with nonnegative terms – Alternating series – Conditional convergence – Absolute convergence. (Chapter 2: Section 2.8 – 2.10 &Chapter 3: 3.1 - 3.4 pages 44-55, 67-75 ).

**UNIT III:Series of real numbers (continuation)**

Rearrangement of series – Tests for absolute convergence – Series whose terms form a nonincreasing sequence – Summation by parts (Chapter 3: section 3.5 – 3.8 Pages 76-90).

**UNIT IV:Binomial theorem**

Vandermonde's Theorem - Binomial theorem for rational index with proof – Summation and approximation (Chapter 3: section 4, 5, 10, 14 Pages 123-127,143-152,168-179).

**UNIT V:Exponential and Logarithmic series**

Exponential and Logarithmic series with proof – Summation of series using the above two theorems and approximation. (Chapter 4: section 1 – 11Pages 188-237).

**Text Books**

1. Richard R. Goldberg, Methods of Real Analysis – Oxford and IBH Publishing Co. Pvt.Ltd., New Delhi, 1970.(for UNIT I,II,III).

2.T.K.Manicavasagam Pillai, Natarajan and Ganapathy, Algebra Vol.1 Publisher: Viswanathan , S.,Printers&Publishers Pvt. Ltd, 2004. (for UNIT IV,V).

**Reference Books**

1. Tom. M. Apostol, Mathematical Analysis, 2nd ed., Narosa Publishing Company, Chennai, 1990.

2. Dr.S.Arumugam, Sequence and Series, New Gamma Publishers, 1999.

3. M.K.Singal and Asha Rani Singal,A first course in Real Analysis,R.Chand and Co Ltd.,1999.

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Define and illustrate the intervals in R, Bounded sets, Monotone sequences and sequence and verify the given Sequences in Convergent and Divergent by using behavior of monotonic sequences. | K1 |
| CO2 | Find Limit points and Upper and lower limits of a sequence. Prove theorems on different test of convergence and divergence of series. | K1&K2 |
| CO3 | Remembering Series of real numbers. | K1 |
| CO4 | Calculate Binomial Series, | K4 |
| CO5 | Calculate Exponential Series and the Logarithmic Series | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | S | S | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong          M – Medium          L – Low**

| Program:  B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| **Core – VI** | | **Course Code:**20UMA3C06 | | **Course Title**:   Mechanics | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** | |
| III | 5 | 75 | 4 | 100 | |

### Course Objectives

To introduce the study of the forces acting at a point and to provide a basic knowledge of parallel forces and projectiles objects in motion.

### UNIT I: Forces Acting at a Point

Resultant and components: Definition-Simple cases of finding resultant–Law of parallelogram of forces – Lami's theorem – Problems.(Chapter II: Sec 1-9 Pages 6-26).

### UNIT II: Parallel Forces and Moments

Like parallel forces–Unlike parallel forces– Moments of a force – Varigon's theorem of moments –Generalized moments of a force-problems. (Chapter III: Sec Pages 1-13 Pages 52-70).

### UNIT III:Projectiles

Projectiles – Path of a projectile – Time of flight – Horizontal range – range on inclined plane-Motion on the surface of a smooth inclined plane-Problems. (Chapter VI:Sec 6.1-6.7&6.12-6.16 Pages 139-156,172-182).

### UNIT IV: Simple Harmonic Motion

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. (Chapter X Sec 10.1-10.7  Pages 309-330).

### UNIT V: Motion Under the action of central forces

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(Chapter XI: Sec 11.1-11.13 Pages 356-397).

### 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)

Bachelor of Science

Mathematics

## Reference Books

1. K. Viswanath Naik, M. S. Kasi, Statics, Emerald Publishers, 1992.

2. K. Viswanath Naik, M. S. Kasi, Dynamics, Emerald Publishers, 1992.

3. Dr.P.P.Gupta, Statics, Kedal Nath Ram Nath, Meerut,1983-84.

4. P. Duraipandian and Laxmi Duraipandian, Mechanics, S.Chand and Company Ltd, Ram Nagar, New Delhi-55, 1985.

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Define Force and Newton's Laws of motion and Forces on a rigid body. | K1 |
| CO2 | Derived Parallel Forces and Moments. | K1&K2 |
| CO3 | Derive Projectiles and Path of a projectile. | K2& K3 |
| CO4 | Define Simple Harmonic Motion andComposition of S.H.M's. | K4&K5 |
| CO5 | Describe Radial and transverse components of velocity and acceleration. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | M | M | S | S |
| CO2 | M | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | M | S | S | M | S |
| CO5 | M | S | S | S | S |

**S – Strong**          **M – Medium**          **L – Low**

| Program: B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – VII** | | **Course Code:**20UMA4C07 | | **Course Title:**Real Analysis-II |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| IV | 6 | 90 | 5 | 100 |

## Course Objectives

1. Gain knowledge about connected sets, compact metric spaces, totally bounded sets and complete metric spaces.

2. To enable to know about the convergence and uniform convergence of sequence of functions and related theorems.

3. Discuss the concepts of the Riemann integral, existence of Riemann integral and properties of Riemann integral.

4. Understand the concepts of derivatives and fundamental theorem of calculus.

5. Develop the ability to reflect, critically on the methods they have chosen to solve problems.

**UNIT I:Continuous functions on metric spaces**

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space 1 – open sets – closed sets – Discontinuous functions on R. (Chapter 5: Sections 5.1 to 5.6 Pages 113-132).

**UNIT II: Connectedness, Completeness, and Compactness**

Connected sets – bounded sets and totally bounded sets – complete metric space-Compact metric spaces – continuous functions on compact metric spaces. (Chapter 5: Sections 6.2 to 6.6 Pages 134-150).

**UNIT III: Calculus**

Sets of measure zero – definition of the Riemann integral – Existence of the Riemann integral – Properties of the Riemann integral. (Chapter 7: Sections 7.1 to 7.4 Pages 156-170).

**UNIT IV: Calculus (Continued)**

Derivatives – rolle's Theorem – The law of the mean – Fundamental theorem of calculus. (Chapter 7: Sections 7.5 to 7.8 Pages 170-189).

**UNIT V: Sequences and Series of functions**Point wise convergence of sequences of functions – uniforms convergence of sequences of functions – consequences of uniform

convergence – convergence and uniform convergence of series of functions. (Chapter 9: Sections 9.1 to 9.4 Pages 231-247).

**Text Book**

1. Richard R. Goldberg, Methods of Real Analysis – Oxford and IBH Publishing co, Pvt. Ltd., New Delhi, 1970

**Reference Books**

1. D.Somasundaram and B.Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, Third Reprint, 2007.

2.Tom. M. Apostel, Mathematical Analysis, Narosa Publications, New Delhi, 2002.

3. V.Karunakaran, Real Analysis, Pearson Publication, India, 2011.

**E-learning Source**

http://www.acadiau.ca/~hteisman/3533notes.pdf

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Discuss Continuous functions on metric spaces. | K1 |
| CO2 | Discuss Connectedness, Completeness, and Compactness. | K1&K2 |
| CO3 | Describe Sets of measure zero, Riemann integral and properties. | K2& K3 |
| CO4 | Illustrate Derivatives and verifying theorems. | K3&K4 |
| CO5 | Describe Sequences and Series of functions. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | S | M | S | S |
| CO2 | M | S | S | S | S |
| CO3 | M | S | S | S | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong          M – Medium          L – Low**

| Program: B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – VIII** | | **Course Code:** 20UMA4C08 | **Course Title**: Graph Theory | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| IV | 5 | 75 | 5 | 100 |

## Course Objectives

1. Acquire the basic knowledge of various types of graphs.

2. Know about the problem-solving power of the graph theory.

3. Know about the applications of graphs to simple situations and puzzles.

**UNIT I: Graphs and Sub graphs**

Introduction – Definition – Examples – Degrees – Definition – Theorem 1, 2 – Problems – Sub graphs – Definition – Theorems – Operations on graphs – Definition theorem–1 – Problems. (Chapter 2: Sections 2.0 – 2.3 and 2.9, Page No: 5-13 & 25-27).

**UNIT II: Connectedness**

Introduction – Walks, Trails and Paths – Definitions Theorem–1,2,3 – Connectedness and Components –Definitions – Theorems – Definition – Distance – Theorems – Cut point – Bridge –Connectivity. (Chapter 4: Sections 4.0 – 4.2 and 4.4, Page No: 34-41 & 45, 46).

**UNIT III: Eulerian and Hamiltonian Graphs**

Introduction – Eulerian Graphs – Definition – Lemmas – Theorem – Konigsberg Bridge problem –Fleury's Algorithms – Hamiltonian graphs – Definitions - Theorems – Lemma – Closure – Theorems. (Chapter 5: Sections 5.0 – 5.2, Page No: 48-57).

**UNIT IV: Trees**

Introduction – Characterization of Trees – Theorems – Centre of a tree – Definition – Theorem. (Chapter 2: Sections 6.0 – 6.2, Page No: 61-65).

**UNIT V: Directed Graphs**

Introduction – Definition – Basic properties definitions – Theorems – Paths and connections – Theorems– Definition – Diagraphs and matrices – Definitions – Theorems. (Chapter 10: Sections 10.0 – 10.3, Page No: 99-109).

**Text Book**

1. S.Arumugam, S.Ramachandran, Invitation to Graph theory, Scitech Publications, Chennai, 2001.

**Reference Books**

1. G.T.John Clark, Derek Allan Holton,A First Book at Graph Theory,world scientific Publishing co,1995.

2. S.Kumaravelu, Susheela Kumaravelu ,Graph Theory,SKV Publishers,Sivkasi,1999.

**E-learning Source**

1. http://nptel.ac.in/courses/111106050/

2. https://cs.bme.hu/fcs/graphtheory.pdf

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Describe the origin of graph theory. | K1 |
| CO2 | Illustrate different types of graph. | K1&K2 |
| CO3 | Discuss Operations on Graphs on Hamiltonian Paths and circuits. | K2& K3 |
| CO4 | Define Trees, fundamental circuits, cut sets, Connectivity andSeparability. | K4 |
| CO5 | Describe Paths and connections. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | S | S | S | S |
| CO3 | M | M | S | M | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | M | S | S |

**S – Strong**        **M – Medium**        **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – IX** | **Course Code:**20UMA5C09 | | **Course Title**: Abstract Algebra | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| V | 5 | 75 | 5 | 100 |

### Course Objectives

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.

2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).

3. Present concepts and properties of various algebraic structures.

4. Discuss the importance of algebraic properties relative to working within various number systems.

5. Develop the ability to form and evaluate conjectures.

6. Studying the rings and their properties.

**UNIT I: Group Theory**

Group – Definition – Examples – Some Preliminary lemmas – Problems – Subgroups – definition – lemmas – Cosets – definition – theorems – Lagrange's Theorem – order of an element – Euler Theorem – Fermat Theorem. (Chapter 2: Sections 2.1-2.4, pages: 26-44).

**UNIT II:Group Theory (Continuation)**

A Counting Principle – Normal Sub Groups – Definition – Properties – Problems – Quotient groups – Definitions – Lemma. (Chapter 2: Sections 2.5-2.6, pages: 44-54).

**UNIT III: Group Theory (Continuation)**

Homomorphism – Definition – Examples - Lemmas - Kernel of a homomorphism – Fundamental theorem – Automorphism – Definition – Inner Automorphism – Lemmas – Examples – Cayley's Theorem. (Chapter 2: Sections 2.7-2.9, pages: 54-74. (Except application 1, 2 & 3)).

## UNIT IV: Ring theory

Ring – Definition – Examples – some special classes of Rings – Zero Divisor – Integral Domain - Field - Definition –Examples-Ideals – Quotient Rings – Maximal ideal. (Chapter 3: Sections 3.1-3.2 & 3.4-3.5, pages: 120-130 & 133-140).

## UNIT V: Ring theory (Continuation)

The Field of Quotient of an Integral Domain – Euclidean Rings – Definition – Principal ideal Ring – Greatest common divisor – Properties – Unique factorization theorem  (Chapter 3: Sections 3.6-3.7, pages: 140-149).

## Text Books

1. I.N. Herstein, Topics in Algebra, John Wiley, New York, 1975.

## Reference Books

1. M.L. Santiago, Modern Algebra, Tata McGraw Hill, New Delhi, 1994.

2.K.Viswanatha Naik, Modern Algebra, Emerald Publishers, 135, Anna Salai, Chennai,1988.

3. A.R. Vasistha, A first course in Modern Algebra, Krishna Prekasan Mandhir, 9, Shivaji Road, Meerut (UP), 1983.

4. Dr.R.Balakrishnan and Dr.N.Ramabadran, A Text Book of Modern Algebra, Vikas Publishing House, New Delhi, 1994.

## E – Learning Sources

1. http://mathworld.wolfram.com

2. http://www.math.uconn.edu/~kconrad/blurbs/grouptheory/coset.pdf

3. http://www3.ntu.edu.sg/home/Frederique/chap2.pdf

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Use technological tools such as computer algebra systems or graphing calculators for visualization and calculation of algebraic concepts. Recognize the concepts of the terms Groups, subgroups. | K1 |
| CO2 | Recognize the concepts of the terms Normal Subgroups and Quotient group. | K2 & K3 |
| CO3 | To learn the concepts of isomorphism and homomorphism for groups. Extend group structure to finite permutation groups (Cayley's Theorem) | K4 |
| CO4 | Define Rings, Subrings, Ideals, Quotient rings Field of quotients of an integral domain. | K4 |
| CO5 | Discuss the Unique Factorization Domain, Euclidean domain, PID | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | M | S | S |
| CO4 | S | M | S | S | S |
| CO5 | S | M | S | S | S |

**S – Strong             M – Medium             L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – X** | | **Course Code:**20UMA5C10 | **Course Title**:   Complex Analysis-I | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| V | 6 | 90 | 5 | 100 |

## Course Objectives

1. To introduce the theory of complex variable this is different from analysis of real variable.

2. Upon completing this course the students will be able to use C-R equations to test for analyticity and compute a derivative, work with standard complex functions.

3. To learn the properties of complex valued function defined on the set of complex numbers.

4. To introduce the concept of an analytic function, bilinear transformations.

**UNIT I: Complex Number System**

Complex number system – Complex number –Field of Complex numbers –Scalar multiplication of a complex number – Conjugation –Absolute value of a complex number – Infinity and extended complex plane – Stereographic projection.(Chapter 1: Sections : 1.1 to 1.3, 1.6,1.7; Chapter 2 : Sections : 2.7,2.8; Page No:1-5,22-23).

**UNIT II: Analytic Functions**

Complex functions – Limit of a function –continuity of a function –Uniform continuity– differentiability and Analyticity of a function –necessary conditions for differentiability – sufficient conditions for differentiability –Cauchy-Riemann equation in polar coordinates – Complex function as a function of Z and Z.–Examples. (Chapter 4: Sections: 4.1 to 4.10 Page No:39-63).

**UNIT III:  Power series and Elementary Functions**

Power Series –Absolute convergence –Uniform of convergence –Analyticity of the sum of power series – Elementary functions: Exponential, Logarithmic, Trigonometric, Harmonic functions–Examples. (Chapter 6: Sections: 6.1 to 6.4, 6.6-6.8, 6.10, 6.12, 6.13, Page No: 80-102).

**UNIT IV: Elementary and Conformal mappings**

Bilinear Transformation–Special Bilinear transformation–circles and inverse points. (Chapter 7: Sections: 7.1 to 7.3, Page No: 103-116).

**UNIT V: Elementary and Conformal mappings (Continuation)**

Transformation of $w = z^2$, $w = Z^{1/2}$, $w = e^z$ , $w = \sin z$ ; $w = \cos z$ , $w = \sinh z$ ; $w = \cosh z$ ,

Conformal Mapping – Examples. (Chapter 7: Sections : 7.4 to 7.9, Page No.:116-132).

**Text Book**

1. P. Duraipandian and Laxmi Duraipandian, Complex Analysis, Emerald Publishers, Chennai –2, 1986.

**Reference Books**

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd., 1974.

2. Santhinarayan, Theory of functions of Complex Variable, S.Chand and Company, Meerut, 1995.

3. Tyagi B.S. Functions of Complex Variable, 17th Edition, and Pragati Prakasham Publishing Company Ltd., Meerut, 1992-93.

**E-Learning Sources**

1. https://www.math.lsu.edu/~neubrand/notes.pdf

2. http://www.iitg.ac.in/physics/fac/charu/courses/ph503/book.pdf

3.https://www.math.ucdavis.edu/~romik/data/uploads/notes/complex-analysis.pdf.

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | To study basic complex number system and Stereographic projection. | K1 |
| CO2 | Understanding and significance of Limits, Continuous functions. Differentiability for complex function and be familiar with the CR-equation. | K2 & K3 |
| CO3 | Discuss Power series and Elementary Functions. | K4 |
| CO4 | Define Conformal Mapping, Bilinear transformations, Cross ratio and Fixed points. | K4 |
| CO5 | Transformation of $w = z^2$, $w = Z^{1/2}$, $w = e^z$, $w = \sin z$ ; $w = \cos z$, $w = \sinh z$ ; $w = \cosh z$. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | S | M | S |
| CO4 | S | M | S | S | S |
| CO5 | M | S | S | S | S |

**S – Strong           M – Medium           L – Low**

| Program: B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – XI** | **Course Code:**20UMA5C11 | | **Course Title**: Mathematical Statistics - I | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| V | 5 | 75 | 5 | 100 |

### Course Objectives

1. To develop the statistical concepts and introduce the techniques of analysis and inference used for research in social and life sciences.
2. To make the students gain wide knowledge in probability this plays a main role in solving real life problems.
3. Know the definition and properties of standard Binomial and Normal distributions and their applications in analyzing data.
4. Know methods of finding correlation and regression coefficients between two data sets and their applications.

**UNIT I: Probability**

Axiomatic Approach to Probability – Random experiment, Sample space and elementary events – Algebra of events – Some Theorems on Probability – Multiplicative Theorem of Probability - Independent Events - Multiplicative Theorem of Probability for independent Events – Baye's Theorem. (Chapter 3: Sections 3.8 (3.8.1, 3.8.2, 3.8.5, 3.8.6), Sections 3.9 (3.9.1, 3.9.2, 3.9.3(Omit Problems)), Sections 3.10 -3.13, Chapter 4 Sections 4.2).

**UNIT II: Mathematical Expectations**

Introduction – Mathematical Expectation or expected value of a random variable – Expected value of functions of a random variables – Properties of expectation – properties of variance – Moment generating function – Cumulants – Properties of Cumulants – Properties of Characteristics of functions – Tchebechev's inequality – Covariance. (Chapter 6: Sections 6.1-6.6, Chapter 7: Sections 7.1, 7.2, 7.3 (7.3.1), 7.5).

**UNIT III: Correlation**

Introduction – Types of correlation – Methods of studying correlation – Karl Pearson's coefficient of correlation - Rank Correlation. Regression: Introduction –

Regression lines – Regression Equations. (Chapter 10 Page 390-405, 416-422, 452-467)

**UNIT IV: Binomial Distribution**

Moments of Binomial Distribution – Recurrance Relation for the Moments of Binomial Distribution – Mean Deivation about Mean of Binomial Distribution – Mode of Binomial Distribution – MGF of Binomial Distribution – Additive Property – Characteristic Function – Cumulants of the Binomial Distribution. Poission Distribution: The Poission Process – Moments – Mode – Recurrance Relation – MGF – Characterisitc Function – Cumulants – Additive property. (Chapter 8 Sections 8.4(8.4.1, 8.4.2, 8.4.4 - 8.4.9) 8.5(8.5.1 – 8.5.8)).

**UNIT V: Normal Distribution**

Introduction – Mode – Median – MGF – Cumulant generating function – Moments – Points of inflexion – Mean deviation about mean. (Chapter 9 Sections 9.1, 9.2 (9.2.3 – 9.2.7, 9.2.9 – 9.2.10).

**Text Books**

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statisitics, Sultan Chand and Sons, New Delhi -2, 2011 (For Units I, II, IV, V).

2. S.P.Gupta, Statistical Methods, Sultan Chand and Sons, New Delhi -2, 2011. (For Unit III).

**Reference Books**

1. R.S.N. Pillai and V.Bagavathi, Statistics, Sultan Chand, New Delhi, 2008.

2. Gupta S.P, Statistical Methods, Sultan Chand, New Delhi, 33rd Edition, 2005.

**E–Learning Source**

1.http://mathword.wolfram.com

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Discuss classical probability, empirical probability and axiomatic approach towards probability. | K1 |
| CO2 | Discuss Mathematical Expectation, Cumulants and Tchebechev's inequality. | K2 |
| CO3 | Understand the concept of Bivariate distribution of Correlation and Regression. | K3 |
| CO4 | Understand the Binomial and Poisson distributions of Moments and Moment generating Function. | K4 |
| CO5 | Describe Normal distribution of Moment generating Function. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | S | S | S | M |
| CO3 | S | S | S | M | S |
| CO4 | S | S | S | S | M |
| CO5 | M | S | S | S | S |

**S – Strong**          **M – Medium**          **L – Low**

| Program: B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| **Group A**<br>**Major Elective - I** | | **Course Code:** 20UMA5E01 | | **Course Title**: Operations Research | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** | |
| V | 5 | 75 | 4 | 100 | |

## Course Objectives

1. To know the origin and development of Operations Research.
2. To introduce the field of operations research which has many applications in management techniques.
3. To develop the skills of formulation of LPP and different techniques to solve it.
4. To know the application of Transportation and Assignment problems.
5. To study the optimizing problems in Game theory, Networking and Inventory control.

**UNIT I: Operations Research**

Operations Research Models–Solving the OR Model–Queuing and Simulation Models–Art of Modeling–More than Just Mathematics–Phases of OR Study–Two-variables LP Model–Graphical LP Solution–Solution of Maximization Model–Solution of Minimization Model. (Chapter 1: Sections 1.1 to 1.6 and Chapter 2: Sections: 2.1-2.2, Page No: 1-10 and 11-25).

**UNIT II: The Simplex Method**

LP Model in Equation form-Transition from Graphical to Algebraic solution–The Simplex Method-Special case in Simplex Method. (Chapter 3: Sections 3.1 to 3.3 and 3.5, Page No: 82-99 and 113-122).

**UNIT III:Transportation Model and its Variations**

Definition of the Transportation Model– Nontraditional Transportation Models–The Transportation Algorithm–The Assignment Model–The Transshipment Model. (Chapter 5: Sections 5.1-5.3, Page No: 193-215 and 221-230).

**UNIT IV: Network Models**

Scope and Definitions of Network Models–Spanning tree algorithm-Shortest route problem–CPM and PERT. (Chapter 6: Sections 6.3.1-6.3.2 and Sections: 6.5.1-6.5.5, Page No: 236-250 and 275-295).

**UNIT V: Decision Analysis and Game Theory**

Decision making under certainty– Decision making under risk– Decision making under uncertainty- Game theory. (Chapter 13: Sections: 13.1-13.4.2, Page No: 489-529).

**Text Book**

1. Hamdy A.Taha,Operations Research(8thEdn.),McMillan Publishing Company,New Delhi, 2007.

**Reference Books**

1. Kantiswarup, P. K. Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Reprint 2013.

2. S. Kalavathy, Operations Research, Vikas Publishing House Pvt. Ltd., 5thEdition, 2006.

3. P.K Gupta, Problems in Operations Research,2-e, S.Chand& Sons, New Delhi, 1983.

4. R. Pannerselvam, Operations Research, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.

5. S. D. Sharma, Operations Research, Kedar Nath Ram Nath and Co., Meerut, 1998.

**E–Learning Sources**

1. http://cs.bme.hu/fcs/operations research.pdf

2. https://books.google.co.in/books?id=wYfxffB62NUC&pg=PA229&dq=elective+ii+opera tions+research&hl=en&sa=X&ved=0ahUKEwiCiMLrt4nbAhWXTX0KHcydACAQ6A EIKTAB#v=onepage&q=elective%20ii%20operations%20research&f=false

3. http://rajkumar2850.weebly.com/uploads/1/4/9/8/14980396/transportation_and_assign ment_problems_2014.pdf

4. http://www.personal.psu.edu/cxg286/Math486.pdf

5. http://www.math.upatras.gr/~tsantas/DownLoadFiles/Hillier&Lieberman_7thedition_ Chapter10.pdf

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--------------|-----------------|
| CO1 | To know the field of operations research this has many applications in management techniques. | K1 |
| CO2 | To know the skills of formulation of LPP and different techniques to solve it. | K2 & K3 |
| CO3 | To know the application of Transportation and Assignment problems. | K2 & K4 |
| CO4 | Definitions of Network Models, Spanning tree algorithm, Shortest route problem, CPM and PERT. | K5 |
| CO5 | To describe decision making under certainty. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1 | M | S | S | M | S |
| CO2 | M | S | M | S | S |
| CO3 | S | M | S | S | S |
| CO4 | S | S | M | S | S |
| CO5 | M | S | S | S | S |

**S – Strong**                    **M – Medium**                    **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Group A**<br>**Major Elective - I** | **Course Code:**20UMA5E02 | | **Course Title**:  Number Theory | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| V | 5 | 75 | 4 | 100 |

## Course Objectives

1. To highlight the niceties and nuances in the world of numbers.

2. To prepare the students for coding through congruence.

3. Know about the basic concepts of number theory.

4. Get a complete grip of various concepts to present modern Mathematics in elementary terms.

5. Develop the skill of solving problems in number theory.

**Unit  I**

The Division Algorithm – The g.c.d. – The Eucliden Algorithm – The Diophantine $ax + by = c$.

**Unit  II**

The Fundamental Theorem of arithmetic, the sieve of Eratesthenes – The Goldbach conjecture – basic properties of congruence.

**Unit  III**

Special Divisibility tests – Linear congruences – The little Fermat's theorem – Wilson's Theorem.

**Unit  IV**

The Functions $\mu$ and The Mobius inversion Formula – The Greatest integer function.

**Unit  V**

Euler's Phi–Function – Euler's Theorem – Some Properties of the Phi – Function.

**Text Book**

1. David M. Burton, 2001, Elementary Number Theory, Universal Book Stall.

**Reference Books**

1. Elementary Theory of Numbers, cy. Hsiung, Allied Publishers, 1995.

2. Elmentary Number Theory, Allyn and Bacon lnc.,Boston, 1980.

3. Introduction to Analytic Number Theory, Tom.M.Apostal, Narosa Publishing House, New Delhi,1989.

**E-Learning Source**

1. http://www2.math.uu.se/~lal/kompendier.pdf

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Describe the Division Algorithm and the Diophantine Equation ax+by=c. | K1 |
| CO2 | To discuss The Fundamental Theorem of arithmetic, the sieve of Eratesthenes – The Goldbach conjecture. | K2 & K3 |
| CO3 | To describe Linear congruences – The little Fermat's theorem – Wilson's Theorem. | K3 |
| CO4 | Derive the Functions $\mu$ and The Mobius inversion Formula | K4 |
| CO5 | Discuss Euler's Phi–Function and Euler's Theorem | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | S | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | M | S | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | S | M | S |

**S – Strong          M – Medium          L – Low**

| Program: B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| **Group B**<br>**Major Elective - II** | | **Course Code:**20UMA5E03 | | **Course Title**: Numerical Methods | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** | |
| V | 5 | 75 | 4 | 100 | |

## Course Objectives

1. To develop skills in solving problems using numerical techniques.

2. This course covers the techniques of Numerical Differentiation and Numerical Integration.

3. It also deals with solution of difference equations, Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order.

**UNIT I: Solution of Algebraic and Transcendental Equations**

Introduction - Graphical Solution of equations - Method of bisection – The iteration method – Newton Raphson method – Generalized Newton's Method for multiple roots – Regula – Falsi method – Muller's method. (Chapter -2, Sections 2.1 to 2.8), (Pages 19-59).

**UNIT II: Interpolation with Equal and Unequal intervals**

Introduction – Missing Values – Newton's binomial expansion formula – Newton's forward interpolation formula – Newton – Gregory backward interpolation formula–Error in the interpolation formula – Newton's general divided differences formula – Lagranges interpolation formula – Inverse interpolation. ( Chapter 4&5 , Sections 4.1 to4.6 & 5.2 to 5.4), (Pages 96-132).

**UNIT III: Central Difference Interpolation Formulae**

Introduction – Gauss's forward interpolation formula – Gauss's backward interpolation formula – Bessel's formula – Stirling's formula – Laplace – Everett's formula. (Chapter 6, Section6.1 to 6.6), (Pages 140-156).

**UNIT IV: Numerical Differentiation and Integration**

Introduction – Derivatives using Newton's forward interpolation formula – Derivatives using Newton's backward interpolation formula – Derivatives using stirling's formula – Trapezoidal rule – Simpson's one-Third rule – Simpson's three-eighth's rule – Weddle's rule.(Chapter 8 & 9, Sections 8.1 to 8.4 & sections 9.3 to 9.6),( Pages 170-183 & 186 to 198).

## UNIT V: Numerical Solution of ordinary Differential Equations

Introduction – Taylor's series method – Euler's method – Modified Euler's method – predictor - corrector method – Milne's method – Adams – Bash forth – Moulton method – Runge – Kutta method – Picard's method of successive approximation.(Chapter 10, Sections 10.1 to 10.9), (Pages 218-253).

### TextBook

1. G.Shanker Rao,Numerical Analysis, New age International Publishers New Delhi Fourth Edition, 2006.

### Reference Books

1.Balagurusamy,Numerical Methods, Tata Me Graw Hill publishing Company Ltd, New Delhi,  2002.

2. S.S.Sastry, Introductory Method of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

3.T.K.Manickavasagam      and      Narayanan      S.Viswanathan&Co.,      Engineering NumericalMethods, Chennai 1998.

### E-Learning Sources

1.http://nptel.ac.in/courses/122102009/

2. http://www.math.ust.hk/~machas/numerical-methods.pdf

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Compute the Solution of Algebraic and Transcendental equation using Bisection, Iteration, Method of false position and Newton Raphson Method. | K1 |
| CO2 | Solve Interpolation of Finite differences – Newton's Forward, Central and Backward differences | K2 & K3 |
| CO3 | Solve Bessel's formula – Stirling's formula – Laplace – Everett's formula. | K3 & K4 |

| CO4 | Obtain the Numerical differentiation and integration. Derive Trapezoidal and Simpson's Rule. | K4 |
| CO5 | Derive and compute the solution of Taylor series, Picard's andEuler method and Runge–Kutta Methods. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO    CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | S | M | S |
| CO2 | M | M | S | S | S |
| CO3 | S | M | S | S | S |
| CO4 | S | S | M | S | M |
| CO5 | M | S | S | M | S |

**S – Strong**          **M – Medium**          **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Group B**<br>**Major Elective - II** | | **Course Code:**20UMA5E04 | | **Course Title**: Combinatorial Mathematics |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| V | 5 | 75 | 4 | 100 |

## Course Objectives

Combinatorial mathematics is the study of the arrangements of objects, according to prescribed rules, to count the number of possible arrangements or patterns, to determine whether a pattern of a specified kind exists and to find methods of constructing arrangements of a given type.

**UNIT I**

Permutations and Combinatory: The Rules of sum and product–Permutations–Combinations –Distributions of distinct objects–Distribution of non-distinct objects–Stirling's formula.(Chapter 1. section 1.1 – 1.7. Page number 1 to 15).

**UNIT II**

Generating Functions Generating functions for combinations – Enumerators for permutations Distributions of distinct objects into non distinct cells – Partitions of integers – The Ferrers graph – Elementary relations. (Chapter: 2 Section 2.1 – 2.7. Page number: 24 to 46).

**UNIT III**

Recurrence relations Linear recurrence relations with constant coefficients – Solution by the technique of generating functions – A special class of nonlinear difference equations – Recurrence relations with two indices. (Chapter: 3 Section 3.1 – 3.5. Page number : 58 to 80).

**UNIT IV**

The Principle of inclusion and exclusion 31 The Principle of inclusion and exclusion – The general  formula – Derangements – Permutations with restrictions on relative positions – The rook polynomials – Permutations with forbidden positions. (Chapter: 4 Section 4.1 – 4.7. Page number : 96 to 115).

## UNIT V

Polya's theory of counting Sets, relations and groups – Equivalence classes under a permutation group – Equivalence classes of functions – Polya's fundamental theorem – Generalization of Polya's theorem.(Chapter:5 Section 5.1 – 5.7. Page number: 126 to 154).

### Text Book

1. C.L. Liu, Introduction to Combinatorial Mathematics, McGraw Hill Book Company, New York, 1968.

### Reference Books

1. Murray Edelberg and C.L. Liu, Solutions to Problems in Introduction to Combinatorial Mathematics, MC Graw-Hill Book & Co., New York, 1968.

2. R.P. Stanley, Enumerative Combinatorics, Volume I, 2nd Edition, Cambridge Studies in Advanced Mathematics (Book 49), Cambridge University Press, 1997.

3. P.J. Cameron, Combinatorics: Topics, Techniques, Algorithms, Cambridge University Press, Cambridge, 1998.

4. Miklos Bona, A Walk through Combinatorics, World Scientific Publishing Company,2002.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Permutation, with and without repetitions, combinations, with and without repetitions. Apply counting strategies to solve discrete probability problems. | K1 |
| CO2 | To describe Generating Functions Generating functions for combinations. | K2 & K3 |
| CO3 | To solve Linear recurrence relations with constant, A special class of nonlinear difference equations and Recurrence relations with two indices. | K4 |
| CO4 | Derive Inclusion-exclusion principle. | K4 |
| CO5 | Discuss Polya's theory of counting Sets, relations and groups. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | S | S | M | S |
| CO2 | M | S | M | S | S |
| CO3 | S | S | S | M | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | M | S | S |

**S – Strong**          **M – Medium**          **L – Low**

| Program: B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| SBEC – I | | Course Code:20UMA5S01 | | Course Title: C-Programming | |
| Semester | Hours/Week | Total Hours | Credits | Total Marks | |
| V | 2 | 30 | 2 | 100 | |

## Course Objectives

1. The course is designed to provide complete knowledge of C language.

2. Students will be able to develop logics which will help them to create programs, applications in C.

3. Also by learning the basic programming constructs they can easily switch over to any other language in future.

**UNIT I:Constants, Variables and Data Types**

Introduction – Character set – Constants – Keywords and Identifiers – Variables – Data Types – Declaration of Variables – Assigning values to variables – Defining symbolic Constants. (Sections: 2.1 to 2.8, 2.10, 2.11) Page No. : 22 to 33 and 38 to 43.

**UNIT II: Operators and Expressions**

Arithmetic operators – Relational operators – Logical operators – Assignment operators – Increment and Decrement operators – conditional operators – Special operators. Arithmetic expressions – Evaluation of Expressions. (Sections 3.2 to 3.7, 3.9, 3.10, 3.11) Page No.: 51 to 59 & 60 to 62.

**UNIT III: Managing Input and output operations**

Reading a character – Writing a character – Formatted input and output.

**Decision making and Branching:** Decision making with IF Statement – Simple IF Statement – IF ELSE Statements – Nesting of IF …ELSE Statement – ELSE IF Ladder - Switch Statement – The?: Operator – GOTO Statement. (Sections 4.2 to 4.5 and 5.2 to 5.9) Page No.: 81 to 94 & 110 to 132.

**UNIT IV: Decision Making and Looping**

WHILE Statement – Do Statement – FOR Statement – Jumps in Loops – Simple Programs. (Sections 6.2 to 6.5) Page No.: 147 to 159.

**UNIT V: Arrays, Character Arrays and String**

Introduction – One Dimensional array – Declaration of one and two dimensional arrays – Initiating of one and two dimensional arrays-Declaring and initializing string variables – Reading strings from terminal – writing sting on the screen–Arithmetic operations on characters – simple problems. (Sections 7.1 to 7.6, 8.1 to 8.5) Page No: 180 to 193 & 217 to 228.

**Text Book**

1. E. Balagurusamy, Reprint 2005, Programming in ANSI C, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rdEdition.

**Reference Books**

1. Peter Aitken and Bradley L Jones, Teach Yourself C in 21 Days, Tech Media, New Delhi, 4thEdition, 1997.

2. Tony Zhang, Teach Yourself, C in 24 Hours, Sams Publications, 1stEdition, 1997.

3. Ram Kumar and Rakash Agrawal, Programming in ANSI C, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1993.

**E-Learning Source**

1. https://www.edx.org/learn/c-programming

2. http://www.plantation-roductions.com/Webster/www.artofasm.com/Linux/PDFs/ConstsVarsAndDataTypes.pdf

3. http://www.lessons2all.com/c_decision_making_looping.php

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Describe Constants, Variables and Data Types, Character set, C tokens. | K1 |
| CO2 | Define Operators and character. | K1 & K2 |
| CO3 | Describe Decision making and Branching. | K3 |
| CO4 | Understand Decision making statements and loop structures in C | K4 |
| CO5 | Define Strings and Arrays. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | M | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong**           **M – Medium**           **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **SBEC – II** | **Course Code:**20UMA5SP01 | | **Course Title**:    C- Programming Practical | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| V | 2 | 30 | 2 | 100 |

## Course Objectives

1. The course is designed to provide complete knowledge of C language.

2. Students will be able to develop logics which will help them to create programs, applications in C.

3. Also by learning the basic programming constructs they can easily switch over to any other language in future.

**Write C program for the following**

1. To Find the sum of N numbers.

2. To Find the Largest of given 3 numbers.

3. To solve a quadratic equations.

4. To find the simple and compound interest.

5. That reads an integer N and determine whether N is prime or not.

6. To arrange the number in ascending and descending order.

7. To generate the Fibonacci sequence.

8. To Find mean and standard deviation.

9. To find addition and subtraction of two matrices.

10. To find the multiplication of two matrices.

**Note**

1. This paper should be handled and valued by the faculty of Mathematics only.

2. Both internal and external examiners for University Practical examination should be appointed from the faculty of Mathematics only.

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – XII** | | **Course Code:**20UMA6C12 | | **Course Title**: Linear Algebra |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| VI | 6 | 90 | 5 | 100 |

## Course Objectives

1. Gain knowledge about fundamental concept of the third algebraic system called vector space which has its origin in geometry and physics and establishes some of the properties of such systems.

2. Analyze the concept of a homomorphism between vector spaces.

3. Bring out the formation of matrices from the concept of linear maps.

4. Know the fundamental concepts of linear transformation on vector space and another concept known as the determinant and rank of a matrix.

5. Determine the existence and nature of solution of system of linear equations.

**UNIT  I: Vector Spaces**

Vector Spaces – Definition – Simple properties – Examples – Homomorphism – Sub space – Quotient spaces – Internal direct sum – External direct sum.  (Chapter 4: Section 4.1, pages: 170-177).

**UNIT  II:Vector Spaces (Continuation)**

Linear Independence – Dimension of a Vector space – Bases - Dimension of Quotient spaces. (Chapter 4: Section 4.2, pages: 177-184).

**UNIT  III: Linear Transformations.**

Inner product spaces – Definition – Examples – Applications – Orthogonal complement of a sub space – Orthonormal & Orthonormal Basis - Gram Schmidt Orthogonalization process. (Chapter 4: Section 4.4, pages: 191-200).

**UNIT IV: Linear Transformations (Continuation)**

Linear Transformation – The Algebra of linear transformations - Characteristic roots – Matrices – Canonical forms – Triangular forms. (Chapter 6: Sections 6.1 - 6.4, pages: 260-292).

## UNIT V: Linear Transformations (Continuation)

Trace and Transpose – Definitions, Properties – Theorems – Determinants – Definitions – Properties – Theorems – Cramer's Rule – Problems. (Chapter 6: Sections 6.8-6.9, pages: 313-336)

### Text Book

1. I.N. Herstein, Topics in Algebra, John Wiley, New York, 1975.

### Reference Books

1. Dr.U.S. Rana,Mathematics for Degree Students (B.Sc. 3rdYears), S. Chand, 2012.

2. A.R. Vasistha, A first course in Modern Algebra, Krishna Prekasan Mandhir, 9-Shivaji Road,Meerut (UP), 1983.

3. M.L. Santiago, Modern Algebra, Tata McGraw Hill, New Delhi, 1994.

4. K. Viswanatha Naik, Modern Algebra, Emerald Publishers, 135, Anna Salai, Chennai, 1988.

### E-Learning Sources

1. http://linear.ups.edu/html/section-S.html

2. http://www.math.northwestern.edu/~scanez/courses/334/notes/dual-spaces.pdf

3. https://mathinsight.org/matrices_linear_transformations

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Define and illustrate Vector Spaces, Subspaces, Homomorphism. | K1 |
| CO2 | Define Linear independence, Basis and dimension of Quotiant Spaces. | K1&K2 |
| CO3 | Define Inner Product Space and Orthogonality. | K2& K3 |
| CO4 | Describe Theory of Matrices. | K4 |
| CO5 | Find the Characteristic equation, Eigen values and vectors.Prove Cayley Hamilton theorem. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | M | S | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong          M – Medium          L – Low**

| Program: B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Core – XIII** | | **Course Code:**20UMA6C13 | | **Course Title**: Complex Analysis – II |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| VI | 6 | 90 | 5 | 100 |

## Course Objectives

1. Compute Taylor and Laurent series expansions of functions and apply the Residue theorem in the evaluation of integrals.

2. Acquire knowledge in series, functions, Residues and integrals.

3. Understand the theorems on convergence of series, methods of finding residues at singular points of a function etc.

4. Analyse the different methods of evaluation of integrals.

### UNIT I : Complex Integration

Simple rectifiable oriented curves – Integration of complex functions- simple integrals using definition–Definite integral–Interior and exterior of a closed curve–Simply connected region–Cauchy's Fundamental theorem– Cauchy's theorem and proof by Goursat–Extension to Cauchy's fundamental theorem–Cauchy's integral formula–Cauchy's integral formula for first derivative– Morera's theorem. ( Chapter 8: Section: 8.1 to 8.9, Page No: 133-142,144-148,150-153,155-157).

### UNIT II : Complex Integration (Continuation)

Cauchy's Inequality – Lioville's theorem – Fundamental theorem of algebra –Maximum modulus theorem-Examples. (Chapter 8: Section: 8.11 , 8.13, Page No:158-161,166-178).

### UNIT III: Taylor's and Laurent's series

Taylor's series –Laurent's series. Singular point – Isolated singularities– Removable Singularity, pole and essential singularity–Determination of the nature of singularity-Examples. (Chapter 9 : Section: 9.1,9.3,9.5 to 9.9 , 9.11,9.13, Page No:179-181,184-193,197-202).

### UNIT IV: Residues

Residues –Calculation of residues – Real definite integrals–Jordan's lemma(Statement only)– Examples. ( Chapter 10 : Section: 10.1 to 10.4 Page No:217-248).

## UNIT V: Meromorphic functions

Meromorphic functions–Principle of argument– Rouche's theorem –Examples– Hurwitz's Theorem – Functions Mermorphic in the extended plane. (Chapter 11: Sections 11.1,11.2,11.3 Page No:249-262).

### Text Book

1. P. Duraipandian and Laxmi Duraipandian, Complex analysis, Emerald Publishers,1995

### References

1. James ward Brown ,Ruel V. Churchill, Complex Variable and Applications, Mcgraw Hill Publishing Company Ltd., 1974.

2. Santhinarayan , Theory of functions of Complex Variable, S.Chand and Company,Meerut, 1995.

3. Tyagi B.S. Functions of Complex Variable, 17thEdition, Pragati Prakasham, Publishing Company Ltd., Meerut, 1992-93.

### E-Learning Sources

1. https://people.math.gatech.edu/~cain/winter99/supplement.pdf

2. https://wiki.math.ntnu.no/_media/tma4175/2016v/solutions_5_ca.pdf

3. http://wwwf.imperial.ac.uk/~jdg/ee2macom.pdf

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--------------|-----------------|
| CO1 | Understand Integration of complex functions and Cauchy's Fundamental theorem. | K1 |
| CO2 | Describe Standard Theorems. | K1&K2 |
| CO3 | Discuss Series and singularity. | K2& K3 |
| CO4 | Define Residues and Solving Problems. | K4 |
| CO5 | Describe Functions Mermorphic in the extended plane. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1 | S | S | M | S | S |
| CO2 | M | M | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | S | S | S | S | S |
| CO5 | M | S | S | S | S |

**S – Strong**            **M – Medium**            **L – Low**

| Program: B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| **Core – XIV** | | **Course Code:**20UMA6C14 | | **Course Title**: Mathematical Statistics – II | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** | |
| VI | 6 | 90 | 4 | 100 | |

## Course Objectives

1. To apply statistical techniques for interpreting and drawing conclusion for business problem.

2. Compute types of sampling parameter and statistics, Tests of significance and Null Hypothesis.

3. Understand Chi-Square variate and independence of attributes.

4. Understand Student's t-test of Difference of means.

5. Define F-Statistic definition and F-test for equality of population Variance.

**UNIT I: Chi Square Distribution**

Introduction–Derivation of $\chi^2$ Distribution – Moment Generating Function of $\chi^2$-t Distribution–F distribution. (Chapter 15 Sections 15.1 to 15.3 Chapter 16 Sections 16.1, 16.2(16.2.1, 16.2.2, 16.2.3), 16.5(16.5.1, 16.5.2, 16.5.3).

**UNIT II: Theory of Estimation**

Introduction – Characteristics of Estimators – Unbiasedness – Consistency – Efficient Estimators – Sufficiency – Cramer-Rao inequality – MVU and Blackwellisation Theorem. (Chapter 17 Sections 17.1, 17.2, 17.3, 17.5).

**UNIT III: Large Samples**

Introduction–Types of Sampling- Parameter and statistic– Test of Significance– Procedure for Testing of Hypothesis– Test of Significance –Sampling of Attributes. (Chapter 14 Sections 14.1 to 14.7).

**UNIT IV:** Applications of $\chi^2$–distribution– Applications of t-distribution – Applications of Fdistribution – Relation between t and F distributions – Relation between F and $\chi^2$distributions. (Chapter 15 Sections 15.6 (15.6.1, 15.6.2) Chapter 16 Sections 16.3 (16.3.1, 16.3.2, 16.3.3), 16.6, 16.7, 16.8).

**UNIT V:** Analysis of Variance – One - Way Classification – ANOVA table – Two – Way Classification. Design of Experiments: Introduction – Experimental Units – Basic Principles

in the Design of Experiments– Complete Block Designs – Completely Randomized Design – Randomized Block Design – Latin Square Design – Analysis of Latin Square Design –Merits and Demerits of Completely Randomized Design – Merits and Demerits of Random Block Design and Latin Square Design. (Chapter 26 Pages 26.14 to 26.27 Chapter 28 Pages 28.1 to 28.17).

**Text Books**

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi- 2, 2011.(For Units I, II, III, IV).

2. P.R.Vittal, Mathematical Statistics, Margham Publications, Chennai 2004. (For unit V).

**Reference Books**

1. B.L.Agarwal, Basic Statistics, New Age International Publishers, Chennai, 2009.

2. S.P.Gupta, Statistical Methods, Sultan Chand and Sons, New Delhi- 2, 2011.

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|-----------|--------------|-----------------|
| CO1 | Understand Chi-Square variate and independence of attributes. | K1 |
| CO2 | Derived Theory of Estimation. | K2 |
| CO3 | Describe Sampling and Applications of Sampling. | K3& K4 |
| CO4 | Applications of $\chi^2$ –distribution, F distribution. | K4 |
| CO5 | Describe Analysis of Variance and Anova Table. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1 | S | M | S | M | S |
| CO2 | M | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong**　　　　　**M – Medium**　　　　　**L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Group C**<br>**Major Elective – III** | **Course Code:**20UMA6E05 | | **Course Title**:  Astronomy | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| VI | 6 | 90 | 4 | 100 |

## Course Objectives

1. Acquire the knowledge about the celestial sphere, solar system and stellar universe.
2. Know about lunar eclipse and solar eclipse.
3. Know about the positions of the stars and the constellations as seen from a given place, at a given time, on a given day.

**UNIT  I**

Standard formulae in spherical Trigonometry – Statements only – celestial sphere – celestial co-ordinates and their conversions–Diurnal Motion–Problems Connected with Diurnal Motion–Zonesof Earth–DIP–Twilight–Problems.

**UNIT  II**

Astronomical refraction–Tangentand Cassini's formulae Geocentric Parallax Helio centric Parallax– Problems.

**UNIT  III**

Kepler's laws of planetary motion – Newton's deductions from kepler's Laws – Equation of Time – Seasons – Calender conversion of time – problems.

**UNIT  IV**

Fixing the Ecliptic–Fixing th eposition of the first point of Aries (Flamsteed's Method)–The moon– Different phases–Metonic cycle–Tides–Problems.

**UNIT  V**

Eclipses – Solar eclipses – Lunar eclipses – General description of Solar system and stellar universe –Problems.

**TextBook**

1.Kumaravelu and Susheela Kumaravelu, Astronomy, S.Kumaravelu, Muruga Bhavanam,Chidambara Nagar, Nagarkoil-2, 1984.

**Reference Book**

1. V.Thiruvenkatacharya,A Text Book of Astronomy,S.Chandand Co.Pvt.Ltd., 1972

**E-Learning Sources**

1. www.kidsastronomy.com

2. www.astronomynow.com

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Discuss Standard formulae in spherical Trigonometry. | K1 |
| CO2 | Derive astronomicalrefraction, TangentandCassini'sformulae and GeocentricParallaxHeliocentricParallax. | K2 |
| CO3 | Describe Kepler's laws of planetary motion. | K3& K4 |
| CO4 | Derive FixingtheEcliptic and Flamsteed'sMethod. | K5 |
| CO5 | Describe Eclipses, Solar eclipses and Lunar eclipses. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | M | S | M | S |
| CO2 | M | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong**      **M – Medium**      **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **Group C** **Major Elective – III** | | **Course Code:**20UMA6E06 | | **Course Title**: Analytical Geometry of 2-D and 3-D |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| VI | 6 | 90 | 4 | 100 |

### Course Objectives

1. To learn the properties of parabola, ellipse and hyperbola.

2. To understand the basic concepts of 3D analytical geometry.

3. To learn the techniques of polar coordinates

4. Acquire practical knowledge about plane, straight line, spheres, cone, cylinder and conicoids in three dimensionals.

5. Develop the skill of solving problems related to plane, straight line, spheres, cone, cylinder and conicoids in three dimensionals.

**Unit I:Analytical Geometry of 2-D**

Coordinates: Rectangular coordinates– Distance between two points–The coordinates of the point dividing the line joining to given points in a ratio– Area of triangle of whose vertices are known-Simple problems.[ Chapter 1(sections 1-4) ( pages 5-11) ].

**Unit II: Analytical Geometry of 3-D**

Straight line – Equation determined by intersection of two planes – Symmetrical form of the equation of the line – Equation of a line passing through two points the plane and straight line – Angle between the plane – Simple problems. [chapter 3( sections1-6) ( pages 46-52 and 56-58)].

**Unit III: Sphere**

Definition – Equation of a sphere-length of the  Equation of tangent– The plane section of a Sphere is a circle – Equation of a circle on a sphere – Intersection of spheres is a circle – Simple Problems.[ chapter 4 (section 1-7 ) ( pages 92-97 and 100-105)].

**Unit IV: Cone**

Equation of a cone – Cone whose vertex is at the origin – Quadric cone whose vertex is at the origin – General Quadric cone –Simple  Problems.[chapter 6 ( section 6.1-6.5 ) ( pages 142-149).

## Unit V: Cylinder

Equation of a cylinder – Bookwork –Right circular cylinder – Simple Problems. [chapter 6 (section 6.6-6.8). (pages 150-153)].

## Text Books

1. T.K.Manicavasagam Pillai and T.Natarajan, A text Book of Analytical Geometry:Two Dimensions ,Part I , Visvanathan Publications, 2006.(For Unit I).

2. T.K.Manicavasagam Pillai and T.Natarajan, A Text Book of Analytical Geometry3D,Visvanathan Publications, 2010.(For Unit II and III).

3. P.Duraipandian and Lakshmi Duraipandian, D.Muhilan, Analytical Geometry 3D, Emerald Publishers 2004. (For unit IV and V).

## Reference Books

1. S.G.Venkatachalapathi, Analytical Geometry 2D and 3D, Margham Publications, Chennai – Reprint 2010.

2. P.R.Vittal,Vector Analysis, Analytical Solid Geometry and Sequence and Series, Margham Publications, Second Edition, Chennai, 1999.

3. P.Duraipandian and Lakshmi Duraipandian, D.Muhilan, Analytical Geometry 2D, Emerald Publishers, Reprint 1988.

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | Describe Coordinates, Area of triangle. | K1 |
| CO2 | Discuss Straight line, Equation determined by intersection of two planes, Symmetrical form of the equation of the line. | K2 |
| CO3 | Discuss Equation of a sphere-length of the Equation of tangent, the plane section of a Sphere is a circle. | K3& K4 |
| CO4 | Describe Equation of a cone, Cone whose vertex is at the origin. | K4 |
| CO5 | Discuss Equation of a cylinder, Bookwork, and Right circular cylinder. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | M | S | M | S |
| CO2 | M | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong**          **M – Medium**          **L – Low**

| Program:  B.Sc Mathematics | | | | |
|---|---|---|---|---|
| **SBEC – III** | **Course Code:**20UMA6S03 | | **Course Title:** Quantitative Aptitude | |
| **Semester** | **Hours/Week** | **Total Hours** | **Credits** | **Total Marks** |
| VI | 4 | 30 | 2 | 100 |

## Course Objectives

1. To learn the problems solving techniques for aptitude problems.

2. To enable to students prepare themselves for various competitive Examinations.

**UNIT I:**

H.C.F & L.C.M of numbers – Average (Section 2,6 Pages 51-68,206-239).

**UNIT II:**

Problems on numbers - Problems on Ages (Section 7,8 Pages 240-263,264-277).

**UNIT III:**

Percentage - Profit & Loss (Section 11,12 Pages 308-373,374-425).

**UNIT IV:**

Time & Work - Time & Distance (Section 17,18 Pages 526-561,562-599).

**UNIT V:**

Area - Volume & Surface area (Section 24,25 Pages 688-765,766-813).

**Text Book**

1. Dr.R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Co. Ltd., 7361, Ram Nagar, New Delhi, 2017.

**Reference Books**

1. Abhijit Guha, Quantitative Aptitude,Tata McGraw Hill Publishing Company Limited, New Delhi, 2005.

2. Dinesh Khattar, Quantitative Aptitude, Pearson Publication, India, 2005.

3. Prof. K.C.Sinha and Anurag Chandra, Quantitative Aptitude for Competitive Examinations Eduwiser's Publishing Group, New Delhi, 2019.

## Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level |
|---|---|---|
| CO1 | To solve H.C.F & L.C.M of numbers and averages. | K1 |
| CO2 | Solve the problems based on Numbers and ages. | K2 |
| CO3 | Solve the problems based onPercentage - Profit & Loss. | K3& K4 |
| CO4 | Solve the problems based onTime & Work - Time & Distance. | K5 |
| CO5 | Solve the problems based onArea - Volume & Surface area. | K5 |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

## Mapping of COs with POs

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | S | M | S | M | S |
| CO2 | M | S | S | S | S |
| CO3 | S | S | S | S | S |
| CO4 | M | S | S | S | S |
| CO5 | S | S | S | S | S |

**S – Strong**         **M – Medium**         **L – Low**

| Program: B.Sc Mathematics | | | | | |
|---|---|---|---|---|---|
| **SBEC – IV** | | **Course Code:**20UMA6SP02 | | **Course Title**: R Programming (Statistics) Pratical | |
| **Semester** VI | **Hours/Week** 2 | **Total Hours** 30 | | **Credits** 2 | **Total Marks** 100 |

## Course Objectives

1. To learn the problems solving techniques for measures of central tendency.

2. To enable to students prepare themselves for binomial, normal and poisson distributions.

## LIST OF EXPERIMENTS

1. Calculation of measures of central tendency

2. Calculation of measures of dispersion

3. Graphical display of data

4. Analyzing data using tables

5. Expectations of discrete and continuous random variable

6. Binomial, Normal and Poisson Distributions

7. One sample t-test

8. Independent sample t-test

9. Dependent sample t-test

10. One-way Between-Groups ANOVA

11. Unplanned and planned comparisons

12. Two-way Between-Groups ANOVA

13. Chi-square test of independence

14. Bi-variate correlation

15. Partial correlation

16. Rank Correlation

17. Linear regression

## Reference Books

1. Mark Gardener, Beginning R – The Statistical Programming Language, Wiley Publications, 2015.

2. W. John Braun and Duncan J. Murdoch, A First Course in Statistical Programming withR, Cambridge University Press, 2007.