# B.Sc. MATHEMATICS

| SEM | COURSE CODE | PART | COURSE | COURSE TITLE | Ins. Hrs /Week | CREDIT | MARKS CIA | MARKS ESE | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **I** | 20U1LT1/LA1/ LF1/LH1/LU1 | I | Language – I | | 6 | 3 | 25 | 75 | 100 |
| | 20UCN1LE1 | II | English - I | | 6 | 3 | 25 | 75 | 100 |
| | 20UMA1CC1 | III | **Core – I** | Differential Calculus & Trigonometry | 5 | 5 | 25 | 75 | 100 |
| | 20UMA1CC2 | | **Core – II** | Solid Geometry | 3 | 2 | 25 | 75 | 100 |
| | 20UPH1AC1 | | **Allied –I** | Fundamentals of Physics | 5 | 4 | 25 | 75 | 100 |
| | 20UPH1AC2P | | **Allied –II** | Properties of Matter – Practicals | 3 | 2 | 25 | 75 | 100 |
| | 20UCN1AE1 | IV | AEC-I | Value Education | 2 | 2 | - | 100 | 100 |
| | | | **TOTAL** | | **30** | **21** | | | **700** |
| **II** | 20U2LT2/LA2/ LF2/LH2/LU2 | I | Language – II | | 6 | 3 | 25 | 75 | 100 |
| | 20UCN2LE2 | II | English – II | | 6 | 3 | 25 | 75 | 100 |
| | 20UMA2CC3P | III | **Core – III** | Mathematical Computations using C++ | 6 | 5 | 25 | 75 | 100 |
| | 20UMA2CC4 | | **Core – IV** | Classical Algebra | 3 | 2 | 25 | 75 | 100 |
| | 20UPH2AC3 | | **Allied – III** | Essentials of Physics | 4 | 3 | 25 | 75 | 100 |
| | 20UPH2AC4P | | **Allied –IV** | Optical, Thermal and Electricity - Practicals | 3 | 2 | 25 | 75 | 100 |
| | 20UCN2SE1 | IV | Skill Enhancement Course - I @ | Soft Skills Development | 2 | 2 | - | 100 | 100 |
| | | | **TOTAL** | | **30** | **20** | | | **700** |
| **III** | 20U3LT3/LA3/ LF3/LH3/LU3 | I | Language– III | | 6 | 3 | 25 | 75 | 100 |
| | 20UCN3LE3 | II | English – III | | 6 | 3 | 25 | 75 | 100 |
| | 20UMA3CC5 | III | **Core– V** | Multi variate Calculus | 4 | 4 | 25 | 75 | 100 |
| | 20UMA3CC6 | | **Core– VI** | ODE & Laplace Transforms | 3 | 2 | 25 | 75 | 100 |
| | 20UMA3AC5 | | **Allied– V** | Mathematical Statistics-I | 4 | 3 | 25 | 75 | 100 |
| | 20UMA3AC6 | | **Allied–VI** | Mathematical Statistics-II | 3 | 2 | 25 | 75 | 100 |
| | 20UMA3GE1 | IV | Generic Elective I # | | 2 | 2 | - | 100 | 100 |
| | 20UCN3AE2 | | AEC-II | Environmental Studies | 2 | 2 | - | 100 | 100 |
| | | | **TOTAL** | | **30** | **21** | | | **800** |
| **IV** | 20U4LT4/LA4/ LF4/LH4/LU4 | I | Language–IV | | 6 | 3 | 25 | 75 | 100 |
| | 20UCN4LE4 | II | English– IV | | 6 | 3 | 25 | 75 | 100 |
| | 20UMA4CC7 | III | **Core– VII** | Advanced Calculus | 5 | 5 | 25 | 75 | 100 |
| | 20UMA4CC8 | | **Core - VIII** | PDE & Fourier Series | 3 | 2 | 25 | 75 | 100 |
| | 20UMA4AC7 | | **Allied– VII** | Mathematical Statistics-III | 4 | 3 | 25 | 75 | 100 |
| | 20UMA4AC8P | | **Allied–VIII** | Statistical Lab using R and SPSS | 4 | 2 | 25 | 75 | 100 |
| | 20UMA4GE2 | IV | Generic Elective - II# | | 2 | 2 | - | 100 | 100 |
| | 20UCN4EA | V | Extension Activities | NCC, NSS, etc. | - | 1 | - | - | - |
| | | | **TOTAL** | | **30** | **21** | | | **700** |
| **V** | 20UMA5CC9 | III | **Core – IX** | Mechanics | 6 | 5 | 25 | 75 | 100 |
| | 20UMA5CC10 | | **Core – X** | Real Analysis | 5 | 5 | 25 | 75 | 100 |
| | 20UMA5CC11 | | **Core – XI** | Algebra | 5 | 5 | 25 | 75 | 100 |
| | 20UMA5CC12 | | **Core - XII** | Numerical Methods | 5 | 5 | 25 | 75 | 100 |
| | 20UMA5DE1 | | DSE – I ** | | 5 | 4 | 25 | 75 | 100 |
| | 20UMA5SE2P | IV | Skill Enhancement Course II@ | | 2 | 2 | - | 100 | 100 |
| | 20UMA5SE3 | | Skill Enhancement Course – III @ | | 2 | 2 | - | 100 | 100 |
| | 20UMA5EC1 | | **Extra Credit Course - I** | General Intelligence for competitive examinations | - | 4* | -- | 100* | 100* |
| | | | **TOTAL** | | **30** | **28** | | | **700** |
| **VI** | 20UMA6CC13 | III | **Core– XIII** | Linear Algebra | 5 | 5 | 25 | 75 | 100 |
| | 20UMA6CC14 | | **Core– XIV** | Complex Analysis | 5 | 5 | 25 | 75 | 100 |
| | 20UMA6CC15 | | **Core - XV** | Number Theory | 5 | 5 | 25 | 75 | 100 |
| | 20UMA6CC16 | | **Core - XVI** | Operations Research | 5 | 5 | 25 | 75 | 100 |
| | 20UMA6DE2 | | DSE II ** | | 5 | 4 | 25 | 75 | 100 |
| | 20UMA6DE3 | | DSE III ** | | 4 | 4 | 25 | 75 | 100 |
| | 20UCN6AE3 | IV | AEC-III | Gender Studies | 1 | 1 | - | 100 | 100 |
| | 20UMA6EC2 | | **Extra Credit Course - II** | Mathematics for competitive examinations | - | 4* | -- | 100* | 100* |
| | 20UMAAECA | | **Extra Credit Course for all** | Online Course | - | 1* | -- | - | - |
| | | | **TOTAL** | | **30** | **29** | | | **700** |
| | | | **GRAND TOTAL** | | **180** | **140** | - | - | **4300** |

**# Generic Elective for other major department**

| SEM | COURSE TITLE |
|-----|-------------|
| III | Quantitative Aptitude |
| IV | Reasoning Ability |

**@ Skill Enhancement Courses**

| SEM | Elective No. | COURSE CODE | COURSE TITLE |
|-----|-------------|-------------|-------------|
| V | II | 20UMA5SE2AP | Maple |
| | | 20UMA5SE2B | Fuzzy Sets |
| V | III | 20UMA5SE3A | MiniProject using e – Mathematical Tool(Group) |
| | | 20UMA5SE3BP | PageMaker |

## ** Discipline Specific Elective

| SEM | D S Elective No. | COURSE CODE | COURSE TITLE |
|-----|-----------------|-------------|-------------|
| V | I | 20UMA5DE1A | Graph Theory |
| | | 20UMA5DE1B | Combinatorics |
| VI | II | 20UMA6DE2A | Astronomy |
| | | 20UMA6DE2B | Data Structures and Algorithms |
| VI | III | 20UMA6DE3A | Mathematica and  MATLAB |
| | | 20UMA6DE3B | Z and Fourier Transform |

**Allied Mathematics for B.Sc. Computer Science**

| SEM | COURSE CODE | PART | COURSE | COURSE TITLE | Ins. Hrs /Week | CREDIT | MARKS CIA | MARKS ESE | TOTAL |
|-----|------------|------|--------|-------------|------|--------|-----|-----|-------|
| I | 20UMA1AC1 | III | Allied –I | Calculus and Differential Equations | 4 | 3 | 25 | 75 | 100 |
| | 20UMA1AC2 | | Allied –II | Numerical Methods | 4 | 3 | 25 | 75 | 100 |
| | | | TOTAL | | 8 | 6 | | | 200 |
| II | 20UMA2AC3 | III | Allied – III | Operations Research | 4 | 3 | 25 | 75 | 100 |
| | 20UMA2AC4 | | Allied –IV | Statistics | 3 | 2 | 25 | 75 | 100 |
| | | | TOTAL | | 7 | 5 | | | 200 |
| | GRAND TOTAL | | | | 15 | 11 | - | - | 400 |

**Allied Mathematics for B.Sc. (Physics)**

| SEM | COURSE CODE | PART | COURSE | COURSE TITLE | Ins. Hrs /Week | CREDIT | MARKS CIA | MARKS ESE | TOTAL |
|-----|------------|------|--------|-------------|------|--------|-----|-----|-------|
| III | 20UMA3AC5:2 | III | Allied–V | Differential and Integral Calculus | 4 | 3 | 25 | 75 | 100 |
| | 20UMA3AC6:2 | | Allied–VI | Algebra and Trigonometry | 3 | 2 | 25 | 75 | 100 |
| | | | TOTAL | | 7 | 5 | | | 200 |
| IV | 20UMA4AC7:2 | III | Allied– VII | Differential Equations | 4 | 3 | 25 | 75 | 100 |
| | 20UMA4AC8:2 | | Allied–VIII | Vector Calculus and Fourier series | 4 | 2 | 25 | 75 | 100 |
| | | | TOTAL | | 8 | 5 | | | 200 |
| | GRAND TOTAL | | | | 15 | 10 | - | - | 400 |

**Allied Mathematics for B.Sc. (Chemistry)**

| SEM | COURSE CODE | PART | COURSE | COURSE TITLE | Ins. Hrs /Week | CREDIT | MARKS CIA | MARKS ESE | TOTAL |
|-----|------------|------|--------|-------------|------|--------|-----|-----|-------|
| III | 20UMA3AC5:3 | III | Allied–V | Differential Calculus | 4 | 3 | 25 | 75 | 100 |
| | 20UMA3AC6:3 | | Allied–VI | Algebra and Trigonometry | 3 | 2 | 25 | 75 | 100 |
| | | | TOTAL | | 7 | 5 | | | 200 |
| IV | 20UMA4AC7:3 | III | Allied– VII | Ordinary and Partial Differential Equations | 4 | 3 | 25 | 75 | 100 |
| | 20UMA4AC8:3 | | Allied–VIII | Statistics and Vector Calculus | 4 | 2 | 25 | 75 | 100 |
| | | | TOTAL | | 8 | 5 | | | 200 |
| | GRAND TOTAL | | | | 15 | 10 | - | - | 400 |

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|------|--------|---------------------|-------|---------|-----------|----------------|----------------|
| I | 20UMA1CC1 | Core – I | DIFFERENTIAL CALCULUS AND TRIGONOMETRY | 5 | 5 | 100 | 25 | 75 |

**Course Outcomes**

1. Apply domain knowledge for derivatives and Trigonometrically transformation of functions with examples.
2. Evaluate the maxima, minima and Lagrange's method of undetermined multipliers
3. Demonstrate the give examples for curvature, evolutes and involutes
4. Discuss the expansion of trigonometric multiple functions.
5. Classify hyperbolic functions with examples.

**UNIT I**                                                                                              **15 hours**
Successive Differentiation: The nth derivatives of Standard result - Trigonometrical transformation of functions - #Formation of equations involving derivatives# - Leibnitz formula for the nth derivative of a product - Related problems.

**UNIT II**                                                                                             **15 hours**
#Homogeneous functions# - Partial derivatives of a function of two functions - Maxima and Minima of function of two variables - Lagrange's Method of undetermined Multipliers.

**UNIT III**                                                                                            **15 hours**
Curvature: Circle, Radius and Center of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Center of Curvature – Evolute and Involute –Radius of curvature when the curve is given in polar co-ordinates.

**UNIT IV**                                                                                             **15 hours**
Expansion of sin $n\theta$, cos $n\theta$, and tan $n\theta$ - Powers of sines and cosines of $\theta$ in terms of functions of multiples of $\theta$.

**UNIT V**                                                                                              **15 hours**
Hyperbolic functions: Relations between Hyperbolic functions – Inverse hyperbolic functions – logarithms of complex numbers.
**# # Self-study portion.**

**Text Books:**
T.B-1 T.K.Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. 2004.
T.B-2 S. Narayanan and T.K. Manicavachagom Pillay, Trigonometry, S. Viswanathan Publishers, Pvt. Ltd., 2006.

| | | | |
|---|---|---|---|
| **UNIT I** | Chapter III | Sections 1.1 -1.6, 2.1, 2.2 | **T.B- 1** |
| **UNIT II** | Chapter VIII | Sections 1.6, 1.7, 4, 5 | **T.B- 1** |
| **UNIT III** | Chapter X | Sections 2.1 – 2.6 | **T.B- 1** |
| **UNIT IV** | Chapter III | Sections 1-2, 4 | **T.B- 2** |
| **UNIT V** | Chapter IV | Sections 1,2 | **T.B- 2** |
| | Chapter V | Section 5 | |

**Books for Reference:**
1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House,2008
2. P.K.Mittal, Trigonometry, VrindaPublications(P) Ltd., 2007.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes :

| Semester | Code | | Title of the Paper | | | Hours | Credits |
|---|---|---|---|---|---|---|---|
| I | 20UMA1CC1 | | DIFFERENTIAL CALCULUS AND TRIGONOMETRY | | | 5 | 5 |

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | | √ | √ | √ | √ | | √ | √ | √ | √ |
| CO2 | √ | √ | | √ | | √ | | √ | | √ |
| CO3 | | √ | √ | √ | | √ | | √ | √ | √ |
| CO4 | √ | √ | √ | | √ | √ | √ | √ | √ | |
| CO5 | √ | | √ | √ | √ | | √ | | √ | √ |
| Number of Matches= 38,  Relationship  :   HIGH | | | | | | | | | | |

**Prepared by :**                                                       **Checked by :**

Dr.P.Murugananatham                                        Dr.M.Mohamed Althaf

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|---|---|---|---|---|---|---|---|---|
| I | 20UMA1CC2 | Core – II | SOLID GEOMETRY | 3 | 2 | 100 | 25 | 75 |

**Course Outcome:**
1: Remember the basic concept of direction cosines and direction ratios, general equation of plane with examples.
2: Demonstrate and illustrate examples of the intersection of two planes.
3: Analyze the various forms of lines and measure the shortest distance.
4: Determine the radius and centre of a sphere.
5: Describe and discuss about a circle on a sphere with examples.

**UNIT I**                                                                                                      **9 hours**
Direction cosines- Direction ratios- General equation of the plane- Intercept form-#Normal form#- Angle between two planes.

**UNIT II**                                                                                                     **9 hours**
Length of the perpendicular- Equation of the planes bisecting the angle between twoplanes- Straight line as the intersection of two planes - Symmetrical form.

**UNIT III**                                                                                                    **9 hours**
Equation of a straight line passing through two given points- Condition for a line to beparallel to a plane – Coplanar lines – Shortest distance between two skew lines – simpleproblems.

**UNIT IV**                                                                                                     **9 hours**
Equation of a sphere - Finding centre and radius – Length of the tangent plane to asphere.

**UNIT V**                                                                                                      **9 hours**
Equation of a circle on a sphere – Intersection of two spheres – Tangent plane to asphere – Simple problems.
**# # Self-study portion.**

**Text Book:**
T.K.Manicavachagom Pillay, T. Narayanan, Analytical Geometry, Part II – 3 Dimensions,
S.Viswananthan Publishers Pvt Ltd.(2009)

| **UNIT I** | Chapter I | Sections 7, 8 |
|---|---|---|
| | Chapter II | Sections 1, 2, 3, 7 |
| **UNIT II** | Chapter II | Sections 10, 11 |
| | Chapter III | Sections 1, 2, 3 |
| **UNIT III** | Chapter III | Sections 4, 5, 7 & 8 |
| **UNIT IV** | Chapter IV | Sections 2-5 |
| **UNIT V** | Chapter IV | Sections 6-8 |

**Books for Reference:**
1. Shanti Narayanan, Analytical Solid Geometry, S.Chand& Company Ltd, New Delhi(2007).
2. M.L. Khanna, Solid Geometry, Jai Prakash Nath& co, Educational Publishers, 25th
Edition (2005).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | Hours | Credits |
|---|---|---|---|---|---|---|
| I | 20UMA1CC2 | | SOLID GEOMETRY | | 3 | 2 |

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | √ | | √ | √ | | √ | √ | | |
| CO2 | √ | √ | | √ | √ | √ | | √ | √ | |
| CO3 | √ | | √ | √ | | | √ | √ | | √ |
| CO4 | √ | √ | √ | √ | √ | √ | | √ | √ | |
| CO5 | | √ | √ | | √ | √ | √ | | √ | √ |
| Number of Matches= 34,  Relationship  :  HIGH | | | | | | | | | | |

**Prepared by :**                                                                              **Checked by :**

Mr. S. Masoothu                                                                       Dr.M.Mohammed Jabarulla

Dr.D.Dhamodharan

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|------|--------|---------------------|-------|---------|------------|----------------|----------------|
| II | 20UMA2CC3P | Core – III | MATHEMATICAL COMPUTATIONS USING C++ | 6 | 5 | 100 | 25 | 75 |

**Course Outcomes:**

**1.** Remember and understanding the concepts of basic data types, variables and operators.

**2.** Illustrate expressions, control structures and functions.

**3.** Find relation between arrays, structures and class with examples.

**4.** Describe constructors, destructors and operator overloading.

**5.** MakeUse Of inheritance in the mathematical problems.

**UNIT I**

What is C++ – A simple C++ program – More C++ statements– Structure of C++ program – Keywords – Identifiers and Constants – Basic Data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables - Operators in C++ - Scope resolution operator – Programs using the above concepts.

**UNIT II**

Expressions and their types – Control structures -Functions in C++ - The main function – Function prototyping – Inline functions – Function overloading – Programs using the above concepts.

**UNIT III**

Specifying a class – Defining member functions – Nesting of member functions – Private member functions – Arrays within a class –Arrays of Objects – Friendly functions – Programs using the above concepts.

**UNIT IV**

Constructors – Parameterized constructors – Multiple constructors in a class – constructors with default arguments – Copy constructor. Destructors –Defining operator overloading – Overloading unary operators - Overloading binary operators – Programs using the above concepts.

**UNIT V**

Inheritance – Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Programs using the above concepts.

**List of Practical:**

**Develop C++ programs**

| List – A: Mathematical Computations | List – B: C++ Concepts |
|-------------------------------------|------------------------|
| 1. To calculate the Simple Interest | |
| 2. To calculate the Area of a Circle | |
| 3. To find out the Roots of a Quadratic Equation | |
| 4. To find the Sum of First N Natural Numbers | |
| 5. To find First N Fibonacci Numbers | |
| 6. To find the GCD and LCM of Two Integers | |
| 7. To calculate the Value of sin(x) | |
| 8. To check if a given Number is Prime number | Any programs using the above concepts |
| 9. To read a Coordinate Point and Determine its Quadrant | |
| 10. To find the Sum of A.P Series | |
| 11. To display Floyd's Triangle | |
| 12. To calculate the value of nPr | |
| 13. To sort the given numbers in ascending order. | |
| 14. To perform matrix addition | |
| 15. To calculate the Mean, Variance & Standard Deviation | |

**Text Book:**

E. Balagurusamy, Object Oriented Programming with C++, Third Edition, Tata McGraw – Hill Publishing Company Limited, Fourth reprint 2006.

**UNIT I**   Chapter 2 – 2.1, 2.3, 2.4, 2.6
                    Chapter 3 – 3.3 to 3.8; 3.10, 3.13, 3.14
**UNIT II**         Chapter 3 -3.19, 3.24,
                    Chapter 4 –4.2 to 4.3; 4.6, 4.9.
**UNIT III**        Chapter 5 – 5.3, 5.4, 5.7, 5.8, 5.9, 5.13, 5.15
**UNIT IV**        Chapter 6 – 6.2 to 6.5; 6.7, 6.11
                    Chapter 7 – 7.2 to 7.4
**UNIT V**         Chapter 8 – 8.2 to 8.9

**Reference Books:**
1. Herbert Schildt, The Complete Reference C++, Fourth Edition, TMH, 2003.
2. K.R. Venugopal, Raj Kumar and T. Ravi Shankar, Mastering C++, TMH, 2005.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | | Credits | |
|---|---|---|---|---|---|---|---|---|---|
| II | 20UMA2CC3P | | MATHEMATICAL COMPUTATIONS USING C++ | | | 6 | | 5 | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| CO2 | √ | | √ | √ | √ | √ | | √ | √ | √ |
| CO3 | √ | √ | | √ | | √ | | √ | | √ |
| CO4 | | √ | √ | | | | √ | √ | √ | |
| CO5 | √ | √ | | √ | √ | | √ | √ | √ | |
| Number of Matches= 36,  Relationship  :  HIGH | | | | | | | | | | |

**Prepared By:**                                  **Checked by:**

Dr.  M.  Mohamed Jabarulla                     Dr.S.Mohamed Yusuff Ansari
Dr. S. Shajitha Begum
Mrs. Z. Sirajunisha

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|---|---|---|---|---|---|---|---|---|
| II | 20UMA2CC4 | Core – IV | CLASSICAL ALGEBRA | 3 | 2 | 100 | 25 | 75 |

**Course Outcomes:**
    **1.** Recognize the concepts of inequalities with examples.
    **2.** Show and illustrate Cauchy Schwartz inequality
    **3.** Find relation between roots and coefficients of equations and symmetric functions of the roots with examples
    **4.** Describe transformation of equation and reciprocal equation with examples.
    **5.** MakeUse of Descarte's rule, Newton's method of divisors and Horner's method to nature of roots in a Problematic Situation

**UNIT I**                                                                                                 **9 hours**
Inequalities - Triangle inequalities - Arithmetic, Geometric and Harmonicmeans.

**UNIT II**                                                                                                **9 hours**
Cauchy - Schwarz inequality - Some more inequalities and related problems.

**UNIT III**                                                                                               **9 hours**
Relation between the roots and coefficients of equations - Symmetric function of the roots - Sum of the powers of the roots of an equation.

**UNIT IV**                                                                                               **9 hours**
Transformation of equation - #Roots with sign changed#, Roots Multiplied by a given number, #Reciprocal roots# - Reciprocal equation - Diminishing,Increasing the roots of a given equation by a given quantity.

**UNIT V**                                                                                                 **9 hours**
Descarte's rule of signs – Newton's method of divisors – Horner's method.
**# # Self-study portion.**

**Text Books:**
**T.B-1** S. Arumugam and A. Thangapandi Isaac, Sequences and series, New Gamma Publishing House (1991).
**T.B-2** T.K. Manicavachagom Pillai, T. Natarajan, and K.S. Ganapathy, Algebra, Volume-I,S. Viswanathan Publishers, Pvt. Ltd. (2004).

**UNIT I**        Chapter 2      Sections 2.1 – 2.3    **T.B-1**
**UNIT II**     Chapter 2      Sections 2.4 – 2.6    **T.B-1**
**UNIT III**    Chapter 6      Sections 11, 12, 13   **T.B-2**
**UNIT IV**    Chapter 6      Sections 15, 16, 17   **T.B-2**
**UNIT V**     Chapter 6      Sections 24, 29.4, 30  **T.B-2**

**Books for Reference:**
1. S. Arumugam, A. Thangapandi Isaac, Algebra (Theory of Equations, Inequalities and Theory of numbers), New Gamma Publishing House (2006).
2. T.K. Manicavachagom Pillai, T. Natarajan, and K.S. Ganapathy, Algebra, Volume-II,S.Viswanathan Publishers, Pvt. Ltd. (2008).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | | Credits | |
|---|---|---|---|---|---|---|---|---|---|
| II | 20UMA2CC4 | | CLASSICAL ALGEBRA | | | 3 | | 2 | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | √ | | √ | √ | √ | √ | | √ | √ | √ |
| CO2 | √ | | √ | √ | √ | √ | | √ | √ | √ |
| CO3 | √ | √ | | √ | | √ | | √ | | √ |
| CO4 | | √ | √ | | | | √ | √ | √ | |
| CO5 | √ | √ | | √ | √ | | √ | √ | √ | |
| Number of Matches= 34, Relationship : Moderate | | | | | | | | | | |

**Prepared By:**                                                      **Checked by:**
Dr.A.Prasanna                                                         Mr.S.Masoothu
A.Nafiunisha

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|----------|------|--------|---------------------|-------|---------|-----------|----------------|----------------|
| I | 20UMA1AC1 | Allied - I | CALCULUS AND DIFFERENTIAL EQUATIONS (For Computer Science) | 4 | 3 | 100 | 25 | 75 |

**Course Outcomes:**
    **1.** Recognize and Recall the basic concept of differentiation and develop the successive differentiation method with examples.
    **2.** Apply domain knowledge for properties of definite integration and integration by parts.
    **3.**Determine 1st order differential equations and Clairaut's form and illustrate the examples.
    **4.** Discuss linear Ordinary differential equation and Partial differential equations.
    **5.** Classify standard types of $1^{st}$ order Partial differential equations with examples.

**UNIT I**                                                        **12 hours**
Successive Differentiation: The nth derivatives of Standard result - #Formation of equations involving derivatives #- Leibnitz formula for the nth derivative of a product - Related problems.

**UNIT II**                                                        **12 hours**
      Properties of definite Integrals – Integration by parts – Reduction formulae for $\int x^n e^{ax} dx$, $\int x^n \cos ax\, dx$, $\int \sin^n x\, dx$, $\int \cos^n x\, dx$.

**UNIT III**                                                       **12 hours**
     Differential equations of the first order with higher degree – Equations solvable for p- Equations Solvable for y – #Equations Solvable for x# - Clairaut'sform

**UNIT IV**                                                      **12 hours**
#Linear Differential Equations with constant coefficients# - Particular integral – Special method of finding P.I. – Derivation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Different integrals of First Order P.D.E.

**UNIT V**                                                       **12 hours**
     Standard type of first order partial differential equations I, II, III and IV (Clairaut's form) - Lagrange's equations.
**#**         **# Self-study portion.**

**Text Books:**
**T.B-1** S.Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-I, S. Viswanathan
Publishers Pvt. Ltd. (2004).
**T.B-2** S.Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-II, S. Viswanathan Publishers Pvt. Ltd.(2004).
**T.B-3** S.Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-III, S. Viswanathan Publishers Pvt. Ltd.(2008).

**UNIT I**         Chapter III      Sections 1.1 – 1.4, 1.6, 2.1      T.B- 1
**UNIT II**        Chapter 1       Sections 11, 12, 13.1 – 13.4     T.B- 2
**UNIT III**      Chapter 1       Sections 5.1–5.4, 6.1, 6.2      T.B- 3
**UNIT IV**      Chapter 2       Sections 1–4             T.B-3
**UNIT V** Chapter 4       Sections 5.1-5.4, 6         T.B-3

**Books for Reference:**
1. S. Arumugam and A.Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).
2. A. Abdul Rasheed, Allied Mathematics, Vijay Nicole Imprints private limited, Chennai (2008).

**Web Source**

1. https://nptel.ac.in/courses/111/107/111107111/

2. https://nptel.ac.in/courses/111/102/111102133/

3. Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | Hours | Credits |
|---|---|---|---|---|---|---|
| I | 20UMA1AC1 | | CALCULUS AND DIFFERENTIAL EQUATIONS (For Computer Science) | | 4 | 3 |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| CO2 | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| CO4 | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| CO5 | ✓ | | ✓ | | | ✓ | | | ✓ | ✓ |
| Number of Matches= 31,  Relationship  :   Moderate | | | | | | | | | | |

**Prepared by:**                                                                       **Checked by:**

Dr. S. Mohamed Yusuff Ansari                                          Mr.N.Mohamed Thoiyab

Mr. T. ShiekPareeth

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|---|---|---|---|---|---|---|---|---|
| I | 20UMA1AC2 | ALLIED –II | NUMERICAL METHODS (For Computer Science) | 4 | 3 | 100 | 25 | 75 |

**Course Outcomes:**
    **1.** Solve the algebraic equations of different methods with examples.
    **2.** Show and illustrate the examples of interpolation and finite difference methods.
    **3.** Find exact solution to the system of linear equations with examples
    **4.** Examine the numerical integration methods.
    **5.** Describe the numerical solution of ordinary differential equations.

**UNIT I**        **12hours**
Solution of Algebraic equations by the bisection method – The iteration method.

**UNIT II**        **12hours**
Solving algebraic equations by Newton – Raphson Method–The Generalized Newton's method - Interpolation: Finite Differences – Forward differences – Backward difference.

**UNIT III**        **12hours**
Exact solutions to a set of linear equations using Gauss Elimination method and Gauss – Jordan Method – Inversion of a matrix using Gauss – Elimination method.

**UNIT IV**        **12hours**
Numerical Integration: Trapezoidal Rule – Simpson's 1/3 rule - Simpson's 3/8 rule

**UNIT V**        **12hours**
Numerical Solution of Ordinary Differential Equations - Numerical solutions to an Ordinary Differential Equation by Euler's Method - Runge-Kutta's second order and fourth order method.

**Text Book:**
P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company Ltd (2010).

| | | |
|---|---|---|
| **UNIT I** | Chapter 3 | Sections 3.1 and 3.2 |
| **UNIT II** | Chapter 3 | Sections 3.4, |
| | Chapter 5 | Sections 5.1 |
| **UNIT III** | Chapter 4 | Sections 4.1, 4.2 and 4.3 |
| **UNIT IV** | Chapter 9 | Sections 9.9, 9.13 and 9.14. |
| **UNIT V** | Chapter 11 | Sections 11.9, 11.12 and 11.13. |

**Book for Reference:**
Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Learning Private Limited, Fourth Edition (2009).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | | Credits |
|---|---|---|---|---|---|---|---|---|
| I | 20UMA1AC2 | | NUMERICAL METHODS (For Computer Science) | | | 4 | | 3 |

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | | √ | √ | √ | √ | | √ | √ | √ | √ |
| CO2 | √ | | √ | √ | √ | √ | | √ | √ | √ |
| CO3 | √ | √ | | √ | | √ | | √ | | √ |
| CO4 | | √ | √ | | | | √ | √ | √ | |
| CO5 | √ | √ | | √ | √ | | √ | √ | √ | |
| Number of Matches= 34,  Relationship  :  Moderate | | | | | | | | | | |

**Prepared By:**                                                        **Checked by:**

Dr. S. Mohamed Yusuff Ansari                              Dr.U.Abuthahir

Mr. T. ShiekPareeth

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|---|---|---|---|---|---|---|---|---|
| II | 20UMA2AC3 | ALLIED – III | **OPERATIONS RESEARCH (For Computer Science)** | 4 | 3 | 100 | 25 | 75 |

**Course Outcomes**

1. Recognize the features of operations research with applications and limitations with practical examples.
2. Solve LPP by Graphical and Simplex methods.
3. Discuss the Basic feasible solution of Transportation problem by different methods.
4. Determine the optimum solution for Assignment Problems with illustrations.
5. Construct Network scheduling and demonstrate critical path analysis with examples .

**UNIT I**                                                                                                                         **12 hours**
Operations Research: Natures and Futures of operations research - Mathematical Formulation of the Problem -Solving a LPP by Graphical Method - General Linear Programming Problem (LPP).

**UNIT II**                                                                                                                       **12 hours**
Canonical Standard Forms - Solving LPP by using Simplex Method – Big- M Method

**UNIT III**                                                                                                                     **12 hours**
Transportation Problem - Finding Initial Basic Feasible Solution by North West Corner Rule, Least Cost Entry Method and Vogel's Approximation method for a given Transportation Problem (Balanced and unbalanced ) - Transportation Problem - Solve Using MODI Method.

**UNIT IV**                                                                                                                     **12 hours**
Assignment Problem (Balanced and unbalanced) – Hungarian Method – Problem of sequencing Problem – processing n-jobs through  two-machine- processing 2-jobs through  k-machine. . Note: Theoretical proof not expected.

**UNIT V**                                                                                                                       **12 hours**
Network scheduling by CPM - Networks basic components - Logical sequencing - Rules of Network constructions - Critical Path Analysis. Note: Theoretical proof not expected.

**Text Book:**
KantiSwarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons Pvt. Ltd., Twelfth Edition, 2004.

**UNIT I**            Chapter 1 & 2&3          Sections 1.1, 1.2, 2.2, 3.2, 3.4
**UNIT II**  Chapter 3 & 4              Sections  3.5, 4.3,
**UNIT III**          Chapter 10                  Sections 10.1 to 10.8 ,10.11
**UNIT IV**          Chapter 10 & 11          Sections 11.1 to 11.4, 12.4,12.6
**UNIT V**  Chapter 21              Sections 21.1 to 21.5

**Books for Reference:**
1. P. Prem Kumar Gupta and D.S. Hira, Operations research, S. Chand (2000).
2. J.K. Sharma, Operations Research Theory and Applications, Macmillan India Ltd. (2000).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits |
|---|---|---|---|---|---|---|---|
| II | 20UMA2AC3 | | OPERATIONS RESEARCH (For Computer Science) | | | 4 | 3 |

| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | | √ | | √ | √ | | | √ | √ | √ |
| CO2 | | √ | √ | √ | | √ | √ | | √ | √ |
| CO3 | √ | | √ | √ | √ | | √ | √ | √ | |
| CO4 | √ | √ | | | √ | √ | √ | √ | | √ |
| CO5 | √ | | √ | | √ | √ | | √ | √ | √ |
| Number of Matches= 34,  Relationship  :  Moderate | | | | | | | | | | |

**Prepared by:**                                                                 **Checked by:**

Dr. P. Murganantham                                                   Dr.M.A.Rifayath Ali

Ms. M. Affrose Begum

| Semester | Code | Course | Title of the Course | Hours | Credits | Max. marks | Internal marks | External marks |
|---|---|---|---|---|---|---|---|---|
| II | 20UMA2AC4 | ALLIED – IV | STATISTICS (For Computer Science) | 3 | 2 | 100 | 25 | 75 |

**Course Outcomes**

**CO1.** Recall and Recognize the basic concepts of mean, median and mode and discuss its merits and demerits.
**CO2.** Examine geometric and harmonic mean and discuss its merits and demerits.
**CO3.** Determine the measures of dispersions and their coefficients.
**CO4.** Interpret the different types of coefficient of correlation with examples
**CO5.** Evaluate the properties of correlation and regression coefficients.

**UNIT I** 9 hours
Arithmetic Mean - Properties of Arithmetic Mean - Weighted mean – Median. #Merits and Demerits of Mean, Median#.

**UNIT II** 9 hours
Mode - Geometric mean - Harmonic mean. Graphical Location of the Partition values. #Merits and Demerits of Mode, Geometric Mean and Harmonic Mean#.

**UNIT III** 9 hours
Dispersion-characteristics for ideal measure of dispersion - Measures of Dispersion - Range - Q.D - M.D - S.D, coefficient of dispersion - #Coefficient of variation# - Simple problems.

**UNIT IV** 9 hours
Correlation – Types of correlation – Scatter diagram – Karl- Pearson's coefficient of correlation –Spearman's Rank correlation

**UNIT V** 9 hours
Regression- Linear - Properties of correlation and regression coefficients.
(Numerical Problems only)

**Text Book:**
S.C. Gupta &V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons,Third Edition, Reprint 2010.

**UNIT I** Chapter 2 Sections 2.3 – 2.6
**UNIT II** Chapter 2 Sections 2.7 – 2.9.1 & 2.11.1
**UNIT III** Chapter 3 Sections 3.1 – 3.7, 3.7.3, 3.8
**UNIT IV** Chapter 10 Section 10.1 to 10.3, 10.6
**UNIT V** Chapter 10 Section 10.7

**Books for Reference:**

1. Murray R. Speigel, John Jschiller, R. Alu Srinivasan, Probability and Statistics, Third Edition, Shaum's Outline Series (2010).
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

| Semester | Code | | Title of the Paper | | | Hours | Credits |
|---|---|---|---|---|---|---|---|
| II | 20UMA2AC4 | | STATISTICS (For Computer Science) | | | 3 | 2 |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
| CO1 | | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| CO2 | √ | √ | | | √ | | √ | | √ | √ |
| CO3 | | | √ | √ | | √ | | √ | | |
| CO4 | √ | √ | | √ | √ | √ | √ | | √ | |
| CO5 | √ | | √ | | √ | √ | | √ | √ | √ |
| Number of Matches= 33, Relationship : Moderate | | | | | | | | | | |

**Prepared by:**                                                      **Checked by:**
Dr. P. Murganantham                                          Dr.A.Prasanna
Ms. M. Affrose Begum