

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS)**

**SALEM – 16**

Reaccredited with 'B++' Grade by NAAC

Affiliated to Periyar University



**Outcome Based Syllabus**

**PG & RESEARCH DEPARTMENT OF MATHEMATICS**

**B.Sc. MATHEMATICS**

**(For the students admitted in 2022-23)**

## **B.Sc. MATHEMATICS**

### **PROGRAMME OUTCOMES**

- PO1 To apply the knowledge of basic mathematics to obtain the solution for the complex mathematical problems
- PO2 To identify, formulate and analyze mathematical problems in research
- PO3 To acquire information and clear understanding in advanced areas of mathematics.
- PO4 To create and analyze mathematical models for solving the problems in the emerging areas of societal and environmental contexts.
- PO5 To apply mathematical knowledge in real life situations and in the context of scientific change via modern tools.
- PO6 To communicate mathematical concepts effectively
- PO7 To equip the students' career needs and to synthesize with the industry requirements
- PO8 To inculcate the ethical responsibilities via mathematical concepts.
- PO9 To enhance the ability of students to transfer ideas and develop team working skills.

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM - 16.  
PG & RESEARCH DEPARTMENT OF MATHEMATICS**

**B.Sc.**

**PROGRAMME STRUCTURE UNDER CBCS**

*(For the students admitted in 2022-23)*

**Total Credits: 140 + Extra Credits (Maximum 28)**

**I SEMESTER**

| Part | Course  | Course Title                                | Code                            | Hrs./Week | Credits   |
|------|---|---|---------------------------------|-----------|-----------|
| I    | Language - I                                      | Tamil /Hindi / Sanskrit - I                 | 22ULTC1/<br>22ULHC1/<br>22ULSC1 | 6         | 3         |
| II   | English - I                                       | Communicative English - I                   | 22ULEC1                         | 6         | 3         |
| III  | Core Course - I                                   | Calculus - I                                | 22UMAC1                         | 5         | 5         |
| III  | Core Course - II                                  | Algebra                                     | 22UMAC2                         | 5         | 5         |
| III  | Allied Course - I                                 | Allied: Physics - I                         | 22UMAAC1                        | 3         | 3         |
|      |   | Allied: Physics - Practical                 | 22UMAAQC                        | 2         | -         |
| IV   | Skill Based - I                                   | Theory of Equations with Matlab - Practical | 22UMASQC1                       | 2         | 2         |
| V    | Extension Activity                                | Group Project based on Extension Activity   | 22UEXAC                         | 1         | 1         |
|      |   | <b>Total</b>                                |                                 | <b>30</b> | <b>22</b> |
| VI   | Articulation and Idea Fixation Skills             |   |                                 |           |           |
|      | Physical Fitness Practice - 35 hours per Semester |   |                                 |           |           |
|      | Advanced Diploma in Vedic Mathematics             |   |                                 |           |           |
|      | Level -1: Certificate Course 100 hours per year   |   |                                 |           |           |

**II SEMESTER**

| Part | Course   | Course Title                                 | Code                            | Hrs./Week | Credits   |
|------|--|--|---------------------------------|-----------|-----------|
| I    | Language - II  | Tamil /Hindi / Sanskrit - II                 | 22ULTC2/<br>22ULHC2/<br>22ULSC2 | 6         | 3         |
| II   | English - II   | Communicative English - II                   | 22ULEC2                         | 6         | 3         |
| III  | Core Course - III  | Analytical Geometry and Trigonometry         | 22UMAC3                         | 5         | 4         |
| III  | Core Course -IV  | Analytical Solid Geometry                    | 22UMAC4                         | 4         | 4         |
| III  | Allied Course - II   | Allied: Physics - II                         | 22UMAAC2                        | 3         | 3         |
|      |  | Allied: Physics - Practical                  | 22UMAAQC                        | 2         | 2+2       |
| IV   | Skill Based - II   | Analytical Geometry with Geogebra- Practical | 22UMASQC2                       | 2         | 2         |
| IV   | Environmental Studies  | Environmental Studies                        | 22UEVSC                         | 2         | 1         |
|      |  | Group Project based on Environmental Studies | 22UEVSPC                        | -         | 1         |
|      |  | <b>Total</b>                                 |                                 | <b>30</b> | <b>25</b> |
| VI   | Articulation and Idea Fixation Skills - 1 Extra Credit             |  |                                 |           |           |
|      | Physical Fitness Practice - 35 hours per Semester - 1 Extra Credit |  |                                 |           |           |
|      | Certificate Course in Yoga – 30 hours – 1 Extra Credit             |  |                                 |           |           |

|  |   |
|--|---|
|  | Advanced Diploma in Vedic Mathematics<br>Level -1: Certificate Course 100 hours per year- 2 Extra Credits |
|  | Extra credits are given for extra skills and courses qualified in MOOC / NPTEL                            |

### III SEMESTER

| Part | Course   | Course Title                              | Code                            | Hrs./Week | Credits      |
|------|--|---|---------------------------------|-----------|--------------|
| I    | Language - III   | Tamil / Hindi / Sanskrit - III            | 22ULTC3/<br>22ULHC3/<br>22ULSC3 | 6         | 3            |
| II   | English - III  | Communicative English - III               | 22ULEC3                         | 6         | 3            |
| III  | Core Course - VII  | Calculus - II                             | 22UMAC5                         | 4         | 4            |
| III  | Core Course - VIII   | Vector Analysis and Theory of Numbers     | 22UMAC6                         | 5         | 4            |
| III  | Allied Course - II   | Allied: Mathematical Statistics - I       | 22UMAAC3                        | 5         | 5            |
| IV   | Skill Based - III  | Data Analytics with R– Practical          | 22UMASQC<br>3                   | 2         | 2            |
| IV   | Non-Major Elective - I   |   |                                 | 2         | 2            |
|      |  | <b>Total</b>                              |                                 | <b>30</b> | <b>23</b>    |
| VI   | Extension Activity   | Group Project based on Extension Activity |                                 |           |              |
|      | Life Skill Courses   | Course - I: Communication Skill           |                                 |           | 2<br>(Extra) |
|      | Articulation and Idea Fixation Skills  |   |                                 |           |              |
|      | Physical Fitness Practice - 35 hours per Semester                                    |   |                                 |           |              |
|      | Advanced Diploma in Vedic Mathematics<br>Level -2: Diploma Course 100 hours per year |   |                                 |           |              |
|      | Extra credits are given for extra skills and courses qualified in MOOC/NPTEL         |   |                                 |           |              |

|                        |                   |           |
|------------------------|-------------------|-----------|
| Non-Major Elective - I | Basic Mathematics | 22UMANEC1 |
|------------------------|-------------------|-----------|

### IV SEMESTER

| Part | Course               | Course Title  | Code                            | Hrs./Week | Credits |
|------|----------------------|---|---------------------------------|-----------|---------|
| I    | Tamil/Hindi/Sanskrit | Tamil / Hindi / Sanskrit - IV   | 22ULTC4/<br>22ULHC4/<br>22ULSC4 | 6         | 3       |
| II   | English - IV         | Communicative English - IV  | 22ULEC4                         | 6         | 3       |
| III  | Core Course - VII    | Differential Equations and Laplace Transforms   | 22UMAC7                         | 4         | 4       |
| III  | Elective - I         | Operations Research/<br>Number Theory   | 22UMAEC1/<br>22UMASEC1          | 5         | 4       |
| III  | Allied - II          | Allied:<br>Theory: Mathematical<br>Statistics– II (3 credits)<br>Practical : Mathematical<br>Statistics Using R<br>Programming - Practical (2<br>credits) | 22UMAAC4<br><br>22UMAAQC        | 5         | 5       |

|   |  |   |           |           |           |
|---|--|---|-----------|-----------|-----------|
| IV  | Skill Based - IV   | Optimization Techniques with Tora – Practical | 22UMASQC4 | 2         | 2         |
| IV  | Non-Major Elective - II  |   |           | 2         | 2         |
|   |  | <b>Total</b>                                  |           | <b>30</b> | <b>23</b> |
| VI  | Extension Activity   | Group Project based on Extension Activity     |           |           | 2 (Extra) |
|   | Life Skill Courses   | Course -II: Professional Skills               |           |           | 2(Extra)  |
|   | Articulation and Idea Fixation Skills - 1 Extra Credit   |   |           |           |           |
|   | Physical Fitness Practice - 35 hours per Semester - 1 Extra Credit                                     |   |           |           |           |
|   | Advanced Diploma in Vedic Mathematics<br>Level -2: Diploma Course 100 hours per year - 2 Extra Credits |   |           |           |           |
| Extra credits are given for extra skills and courses qualified in MOOC/NPTEL and societal oriented group projects |  |   |           |           |           |

|                        |  |           |
|------------------------|--|-----------|
| Non-Major Elective –II | Mathematics for Competitive Examinations | 22UMANEC2 |
|------------------------|--|-----------|

### V SEMESTER

| Part   | Course  | Course Title  | Code                               | Hrs./ Week | Credits   |
|--|---|---|------------------------------------|------------|-----------|
| III  | Core Course - VIII  | Real Analysis – I   | 22UMAC8                            | 6          | 4         |
| III  | Core Course– IX   | Complex Analysis - I  | 22UMAC9                            | 5          | 4         |
| III  | Core Course– X  | Modern Algebra  | 22UMAC10                           | 6          | 4         |
| III  | Core Course– XI   | Mechanics   | 22UMAC11                           | 5          | 5         |
| III  | Elective - II   | Theory: BioMathematics (3 credits)<br>Practical :BioMathematics (1 credit)<br>/ Data structures | 22UMAEC2<br>22UMAEQC/<br>22UMASEC2 | 5          | 4         |
| IV   | Non-Major Skill Based-I   |   |                                    | 2          | 2         |
| IV   | Value Education   |   | 22UVENC                            | 1          | -         |
|  |   | <b>Total</b>  |                                    | <b>30</b>  | <b>23</b> |
| VI   | Extension Activity  | Group Project based on Extension Activity   |                                    |            |           |
|  | Life Skill Courses  | Course - III : Leadership Skills  |                                    |            | 2 (Extra) |
|  | Articulation and Idea Fixation Skills   |   |                                    |            |           |
|  | Physical Fitness Practice - 35 hours per Semester   |   |                                    |            |           |
|  | Advanced Diploma in Vedic Mathematics<br>Level -3: Advanced Diploma Course 100 hours per year |   |                                    |            |           |
| Internship Training - 1 Extra Credit   |   |   |                                    |            |           |
| Extra credits are given for extra skills and courses qualified in MOOC/NPTEL |   |   |                                    |            |           |

|                         |  |            |
|-------------------------|--|------------|
| Non-Major Skill Based-I | Industrial Mathematics with R Programming– Practical | 22UMAQNCS1 |
|-------------------------|--|------------|

## VI SEMESTER

| Part  | Course  | Course Title   | Code              | Hrs./Week                   |                           | Credits                            |  |
|---|---|--|-------------------|-----------------------------|---------------------------|------------------------------------|--|
| III   | Core Course - XVI   | Real Analysis - II   | 22UMAC12          | 6                           |                           | 4                                  |  |
| III   | Core Course - XVII  | Complex Analysis - II  | 22UMAC13          | 5                           |                           | 4                                  |  |
| III   | Core Course - XVIII   | Linear Algebra   | 22UMAC14          | 6                           |                           | 4                                  |  |
| III   | Core Course - XIX   | Numerical methods  | 22UMAC15          | 5                           |                           | 4                                  |  |
| III   | Elective - III  | Society Connect<br>Multidisciplinary<br>Group Project with<br>reference to Bio<br>Mathematics/ Graph<br>theory | 22UMAEP/22UMASEC3 | 2<br>hrs.<br>field<br>visit | 3 hrs.<br>Project<br>work | 2<br>credits<br>for field<br>visit | 2<br>credits<br>for<br>Project<br>work |
| IV  | Non-Major Skill Based-II  |  |                   | 2                           |                           | 2                                  |  |
| IV  | Value Education   |  | 22UVENC           | 1                           |                           | 2                                  |  |
|   | <b>Total</b>  |  |                   | <b>30</b>                   |                           | <b>24</b>                          |  |
| VI  | Extension Activity  | Group Project based on<br>Extension Activity   |                   |                             |                           | 2 (Extra)                          |  |
|   | Life Skill Courses  | Course - IV: Universal<br>Human Values   |                   |                             |                           | 2 (Extra)                          |  |
|   | Articulation and Idea Fixation Skills - 1 Extra Credit  |  |                   |                             |                           |                                    |  |
|   | Physical Fitness Practice - 35 hours per Semester - 1 Extra Credit  |  |                   |                             |                           |                                    |  |
|   | Advanced Diploma in Vedic Mathematics<br>Level -3: Advanced Diploma Course 100 hours per year - 2 Extra Credits |  |                   |                             |                           |                                    |  |
| Extra credits are given for extra skills and courses qualified in MOOC/ NPTEL |   |  |                   |                             |                           |                                    |  |

• **Free and Open-Source Software (FOSS) - 2 Hours Per Semester**

|                          |  |            |
|--------------------------|--|------------|
| Non-Major Skill Based-II | Mathematical Modeling with R<br>Programming– Practical | 22UMAQNCS2 |
|--------------------------|--|------------|

**ALLIED COURSES OFFERED TO OTHER MAJORS**

| <b>SEMESTER</b> | <b>COURSE TITLE</b>   | <b>CODE</b>             | <b>HOURS /WEEK</b> | <b>CREDITS</b> |
|-----------------|---|-------------------------|--------------------|----------------|
| I               | Allied Mathematics - I<br>(For I - B.Sc. Statistics )                                 | 22USTAC1                | 5                  | 5              |
| I               | Allied Mathematics - I<br>(For I - B.Sc. Computer Science)                            | 22UCSAC1                | 5                  | 5              |
| II              | Allied Mathematics - II<br>(For I - B.Sc. Statistics /<br>I - B.Sc. Computer Science) | 22USTAC2/<br>22UCSAC2   | 5                  | 5              |
| III             | Allied Mathematics - I<br>(For II - B.Sc. Physics / II -<br>B.Sc. Chemistry)          | 22UPHAC3/<br>22UCHAC3   | 5                  | 5              |
| III             | Business Mathematics<br>(For II - B.Com)  | 22UCOAC3                | 5                  | 5              |
| IV              | Allied Mathematics -II<br>(For II - B.Sc. Physics / II -<br>B.Sc. Chemistry)          | 22UPHAC4/<br>22UCHAC4   | 3                  | 3              |
|                 | Allied Mathematics -Practical<br>(For II - B.Sc. Physics / II -<br>B.Sc. Chemistry)   | 22UPHAMQC/<br>22UCHAMQC | 2                  | 2              |

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**  
**For candidates admitted from 2022 -2023 onwards**

**Programme Title : B.Sc. MATHEMATICS**

**CourseTitle :Calculus- I**

**CourseCode :22UMAC1**

**Semester :I**

**Hours/Week:5Semester**

**Credits:5**

**CourseObjectives:**

1. To make the students familiarize with the successive differentiation and Higher order partial derivatives.
2. To develop the ability of obtaining Maxima and Minima of functions of 2 (or) 3 variables.
3. To discuss the concepts of Curvature, Radius of curvature and Evolutes.

**SYLLABUS**

**Unit-I(Hours:15)**

Successive differentiation - nth derivatives, Leibnitz theorem (statement only) and applications.

Chapters 1 and 2

Application of differentiation:

Web link : <https://study.com/academy/lesson/differential-calculus-definition-applications.html> <https://youtu.be/LFDU508RmQg>

**Unit- II(Hours:15)**

Partial derivative, Higher derivatives, Homogenous function, Total differential coefficient, Implicit functions.

Chapter 3 (Sections: 1.1-1.3, 2.3, 2.4)

Application for Implicit functions:

Web link: <https://www.google.com/url?sa=t&source=web&ret=j&url=https://study.com/academy/lesson/implicit-differentiation-examples-formulaquiz.html&ved=2ahUKEwjUwbe5oLj0AhU0wzGhC49Cug4KBCjtAF6BAgFEAE&usq=A0vVawlympbwXefEkGzPjWC80z74>

**Unit-III(Hours:15)**

Jacobians, Maxima and Minima of Functions of two variables, Necessary and sufficient conditions (without proof), Method of Lagrange's multipliers (no derivation) - simple problems only.

Chapter 3 (Sections :3-5)

Applications of Maxima and Minima

Web link : [https://www.youtube.com/watch?v=lo\\_V5oS1\\_rc](https://www.youtube.com/watch?v=lo_V5oS1_rc)

Application of Jacobian in daily life:

Web link: <https://youtu.be/QCIE0s3G9w0>

**Unit -IV (Hours:15)**

Polar co-ordinates - Angle between Radius Vector and the Tangent, Angle of intersection of two curves, Length of perpendicular from the pole to the Tangent, Pedal Equation, Radius of curvature in Polar Co-ordinates, Radius of Curvature for pedal curve, Radius of curvature for polar tangential curve.

Chapters 5 and 6

Application of Polar co-ordinates

Web link: <https://www.youtube.com/watch?v=OfjAoQLCB0E>

**Unit -V:(Hours:15)**

Curvature and Radius of Curvature - Cartesian Formula for Radius of Curvature, Parametric formula for Radius of Curvature, Centre of curvature, Chord of curvature, Evolutes.



Chapters 6 and 9  
 Application of Radius of Curvature  
 Weblink: <https://youtu.be/VGcJv8tLPTU>

**Book for study:**

1. P.R. Vittal and V. Malini, Calculus, Margham Publications, Chennai-17.

**Books for Reference:**

1. S. Narayanan and T. K. Manicavachagom Pillai, Calculus Volume I, S. Viswanathan (Printers and Publishers) Pvt Limited, Chennai-2011.
2. S. Arumugam and Isaac, Calculus, Volume - I, New Gamma Publishing House, 1991.

**Web Resources:**

1. <http://www.math.wise.edu>free221>
2. [www.ma.huji.ac.il>iWeb>Teaching\\_files](http://www.ma.huji.ac.il>iWeb>Teaching_files)

Note: Questions to be taken only from the Text Book.

**Course Outcomes (CO): On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | learn the notions of Differential Calculus  | K-1             |
| 2.        | understand the concepts of nth derivative, partial derivatives, Radius of curvature in polar co-ordinates and Cartesian Co-ordinates and evolutes | K-2             |
| 3.        | apply the concepts of the course to solve the related problems  | K-3             |
| 4.        | Analyse the applications of angle between the radius vector and the tangent, evolute of the curve   | K-4             |
| 5.        | evaluate radius of curvature in polar co-ordinates and Cartesian co-ordinates   | K-5             |

**K-1: Recall; K-2: Understand; K-3: Apply; K-4: Analyze; K-5: Evaluate; K-6: Create**

**Mapping of COs with POs :**

| PO \ CO | PO   |      |      |      |      |      |      |      |      |
|---------|------|------|------|------|------|------|------|------|------|
|         | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
| CO1     | S    | L    | S    | M    | S    | S    | S    | S    | S    |
| CO2     | S    | L    | S    | M    | S    | S    | S    | S    | S    |
| CO3     | S    | L    | S    | M    | S    | S    | S    | S    | S    |
| CO4     | S    | L    | S    | M    | S    | S    | S    | S    | S    |
| CO5     | S    | L    | S    | M    | S    | S    | S    | S    | S    |

**S-Strong, M-Medium, L-Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title :ALGEBRA**

**Course Code :22UMAC2**

**Hours / Week:5**

**Semester :I**

**Credits:5**

**Course Objectives**

1. To gain knowledge about binomial series, exponential series, logarithmic series and matrices.
2. To develop the ability of solving different types of algebraic equations.
3. To develop the ability to reflect critically on the methods they have chosen to solve problems.

**Unit -I(Hours:15)**

Binomial Series: Binomial theorem for a positive integral index - Binomial theorem for a rational index - Summation of Binomial series.

Exponential Series: Exponential series for all real values of  $x$  - Standard results for the exponential series - Logarithmic series.

Chapter 2 (Sections 1, 2, 3), Chapter 3 (Sections 1 & 2) & Chapter 4  
An application of Exponential and Logarithmic Series on carbon dating

Web link: <https://www.youtube.com/watch?v=TheDgtcdr5s>

**Unit-II(Hours:15)**

Matrices: Condition for consistency - Characteristic equation of a matrix - Cayley-Hamilton theorem - Similarity of matrices - Diagonalizable matrix.

Chapter 6

Analysing weather condition via Determinants and Matrices

Web link: <https://www.youtube.com/watch?v=hX8LEg6qh8c>

**Unit -III(Hours:15)**

Theory of equations: Rational integral equation of the  $n^{\text{th}}$  degree, Fundamental theorem in the theory of equations (without proof) - Relation between the roots and coefficients of an equation - Imaginary and Irrational roots - Symmetric functions of the roots of an equation in terms of its coefficients.

Chapter 7 (Sections 1 to 5)

Usage of polynomial equations on solving equations involving projectile motions

Web link: [https://math.libretexts.org/Bookshelves/Algebra/Book%3A\\_Elementary\\_Algebra\\_\(Arnold\)/05%3A\\_Polynomial\\_Functions/5.03%3A\\_Applications\\_of\\_Polynomials](https://math.libretexts.org/Bookshelves/Algebra/Book%3A_Elementary_Algebra_(Arnold)/05%3A_Polynomial_Functions/5.03%3A_Applications_of_Polynomials)

**Unit -IV(Hours:15)**

Reciprocal equations - Transformation of equation - Multiplication of roots by  $m$  - Diminishing the roots of an equation - Removal of a term.

Chapter 7 (Sections 6-10)

Graphing a reciprocal function using transformation

Web link: <https://storyofmathematics.com/reciprocal-function>

## Unit-V(Hours:15)

Descartes' rule of signs – Descartes' rule of signs for negative roots of an equation - Horner's method for approximation of roots of a polynomial equation - Newton's method of evaluating a real root correct to given decimal places.

Chapter 7 (sections 11–14)

Solving Cubic equations by Cardon's method – Biquadratic equations – Solution by Ferrari's method

Weblink: <https://egyankosh.ac.in/bitstream/123456789/17881/1/Unit-3.pdf>

### Book for study:

1. Dr.P.R.Vittal & V.Malini, Algebra, Analytical Geometry & Trigonometry by Margham publications, Chennai-17.
2. T.K.Manickavasagam Pillai & others, Algebra Volume I, S.V.Publications, 1985.

### Books for Reference:

1. T.K.Manickavasagam Pillai & others, Algebra Volume II, Revised Edition, S.V.Publications, 1985.

### Web Resources:

1. <https://www.britannica.com/science/mathematics/Theory-of-equations>
2. <https://www.onlinemath4all.com/how-to-check-consistency-of-linear-equations-using-matrices.html>
3. [https://www.brainkart.com/article/Introduction-to-Binomial,-Exponential-and-Logarithmic-series\\_35107/](https://www.brainkart.com/article/Introduction-to-Binomial,-Exponential-and-Logarithmic-series_35107/)

### Course Outcomes (CO): On completion of the course, students would be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Learn about series expansions, reciprocal equations and the results governing them.  | K-1             |
| CO2       | Solve problems on matrices and problems involving Descartes' rule of signs, Horner's method  | K-2             |
| CO3       | Apply the fundamental theorem of Algebra for solving problems in theory of equations   | K-3             |
| CO4       | Diminish, increase and remove the roots of an equation and identify the relation between the roots and the coefficients of an equation | K-4             |
| CO5       | Examine consistency of system of equations, verify Cayley-Hamilton theorem and evaluate the roots using Newton's method.               | K-4 & K-5       |

**Mapping of COs with POs:**

| <b>CO \ PO</b> | <b>PO</b>  |            |            |            |            |            |            |            |            |
|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> |
| <b>CO1</b>     | S          | L          | S          | S          | M          | S          | S          | S          | S          |
| <b>CO2</b>     | S          | S          | S          | S          | M          | S          | S          | S          | S          |
| <b>CO3</b>     | S          | S          | S          | S          | M          | S          | S          | S          | S          |
| <b>CO4</b>     | S          | M          | S          | S          | M          | S          | S          | S          | S          |
| <b>CO5</b>     | S          | S          | S          | S          | M          | S          | S          | S          | S          |

**S-Strong, M-Medium, L-Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. Mathematics**

**Course Title : THEORY OF EQUATIONS WITH MATLAB**

**Course Code : 22UMASQC1**

**Semester : I**

**Hours / Week: 2**

**Credits: 2**

**Course Objective:**

To impart knowledge on solving problems on Theory of equations using computer with MATLAB.

**Syllabus**

**Unit- I**

Creating and working with Arrays and Matrices.

**Unit- II**

Symbolic computation, Matrix and Array operations.

**Unit - III**

Determinants, Eigen Values and Eigen Vectors

**Unit- IV**

Solving a linear system and Gaussian Elimination

**Unit - V**

Matrix factorization, Polynomial factorization and Roots of a Polynomial.

**Book for Study:**

1. Rudra Pratap, Getting started with MATLAB

**Web Resources:**

1. <https://www.mathworks.com/help/symbolic/factor.html>
2. <https://www.mathworks.com/help/symbolic/horner.html>
3. <https://m.njit.edu/Undergraduate/Matlab/M111MATLAB2S08/>

**Course Outcomes (CO): On completion of the course, students would be able to**

| CO Number | PO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1         | get acquainted with fundamental operations in matrices using MATLAB                         | K1              |
| 2         | know matrix factorization and Gaussian elimination by MATLAB.                               | K2              |
| 3         | acquire knowledge to find eigenvalues, eigenvectors & determinants in MATLAB.               | K2              |
| 4         | apply MATLAB and familiar with polynomial factorization and roots of the polynomial         | K3              |
| 5         | acquire knowledge to create symbolic variables and use them in defining functions in Matlab | K3              |

**K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6 Create**

**Mapping of Cos with Pos and PSOs:**

| CO \ PO | PO  |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1     | S   | M   | M   | S   | S   | S   | S   | S   | S   |
| CO2     | S   | M   | M   | S   | S   | S   | S   | S   | S   |
| CO3     | S   | M   | M   | S   | S   | S   | S   | S   | S   |
| CO4     | S   | M   | M   | S   | S   | S   | S   | S   | S   |
| CO5     | S   | M   | S   | S   | S   | S   | S   | S   | S   |

**S-Strong, M -Medium, L-Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title :B.Sc. MATHEMATICS**

**Course Title : ANALYTICAL GEOMETRY AND TRIGONOMETRY**

**Course Code : 22UMAC3**

**Hours/Week:5**

**Semester : II**

**Credits :4**

**Course Objectives:**

1. To discuss polar coordinates, Equations of straight line, Circle and Conic.
2. To gain knowledge about hyperbolic and inverse hyperbolic functions, Logarithm of Complex numbers, Gregory series and summation using telescopic method.
3. To discuss the above concepts with suitable examples.

**SYLLABUS**

**Unit – I(Hours : 15)**

Polar coordinates - Definition of Polar coordinates – Relation between cartesian coordinates and polar coordinates - Polar equation of a straight line - Polar equation of a straight line in normal form - Equation of a straight line joining the two points - Polar equation of a circle - Equation of the chord of the circle  $r = 2a \cos\theta$  on the line joining the points  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$  - Equation of the normal at  $\alpha$  on the circle  $r = 2a \cos\theta$ - Equation of the circle on the line joining the points  $(a, \alpha)$  and  $(b, \beta)$  as the ends of a diameter - examples and exercise.

Chapter 4 (Page 4.1 - 4.13)

Real life applications of Coordinate Geometry:

<https://youtu.be/96NS4tbMOp8>

<https://youtu.be/OfjAoQLCBoE>

**Unit –II(Hours : 15)**

Polar equation of a conic - Trace of the conic  $\frac{l}{r} = 1 + e \cos(\theta - \alpha)$ - Equation to the directrix corresponding to the pole - Equation to the directrix corresponding to focus other than the pole - Equation of chord joining the points whose vectorial angles are  $\alpha - \beta$  and  $\alpha + \beta$  on the conic - Equation of the tangent at  $\alpha$  on the conic  $\frac{l}{r} = 1 + e \cos\theta$  - Equation of normal of the point at  $\alpha$  on the conic  $\frac{l}{r} = 1 + e \cos\theta$  - Asymptotes of the conic  $\frac{l}{r} = 1 + e \cos\theta$  - Equation of chord of contact of tangents from  $(r_1, \theta_1)$  to the conic  $\frac{l}{r} = 1 + e \cos\theta$  - Equation of the polar of any point with respect to the conic  $\frac{l}{r} = 1 + e \cos\theta$  – examples and exercise.

Chapter 4 (Page 4.14 - 4.47)

[https://youtu.be/JDghwEM2\\_Ys](https://youtu.be/JDghwEM2_Ys)

**Trigonometry**

**Unit –III(Hours : 15)**

Expansions of  $\sin \theta$ ,  $\cos\theta$ ,  $\tan \theta$  in terms of  $\theta$  - Expansions of  $\text{Sinn}\theta$ ,  $\text{Cosn}\theta$ ,  $\text{tann}\theta$  - Expansions of  $\text{sinn}\theta$ ,  $\text{cosn}\theta$ ,  $\text{tann}\theta$  - Hyperbolic and inverse hyperbolic functions.

Chapter 11 (Page 11.1 -11.60)

Real life applications of trigonometry:

<https://www.mathnasium.com/blog/real-life-applications-of-trigonometry>

<https://www.embibe.com/exams/real-life-applications-of-trigonometry/>

Applications of Hyperbolic functions:

<https://youtu.be/Y66Y6ksLP6Y>

**Unit – IV(Hours : 15)**

Logarithm of a complex number, general value and principal value, Gregory series.

Chapter 11 (Page 11.61 - 11.85)

Examples of Gregory series:

<https://youtu.be/pwWWi2rPsw8>

**Unit –V(Hours : 15)**

Summation of series, Sum of Sines (Cosines) of n angle in A.P, Summation using telescopic method ( $V_n = U_n - U_{n-1}$ ) and the C+ iS method.

Chapter 11 (Page 11.86 - 11.123)

Telescopic series:

<https://www.khanacademy.org/math/integral-calculus/ic-series/ic-telescoping-series/v/telescoping-series>

**Books for study**

1.Dr.P.R.Vittal and V.Malini, Calculus(for Unit I & II).

2. Dr.P.R. Vittal and V.Malini, Algebra, Analytical Geometry and Trigonometry (for Unit III, IV & V), Margham publications, Chennai - 17.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>1.</b>        | learn about the basic concepts on Analytical geometry and Trigonometry  | <b>K-1</b>             |
| <b>2.</b>        | understand the concepts of polar equations of straight line, circle and conic, expansion of circular functions, hyperbolic functions and trigonometric series | <b>K-2</b>             |
| <b>3.</b>        | calculate summation of trigonometric series and solve problems on straight line, circle and conic   | <b>K-3</b>             |
| <b>4.</b>        | examine the nature of straight line, circle and conic and prove trigonometric identities  | <b>K-5,K-4</b>         |
| <b>5.</b>        | solve various problems using expansions of trigonometric functions, hyperbolic and inverse hyperbolic functions and logarithm of complex numbers              | <b>K-3</b>             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5:Evaluate; K-6 :Create.**



**Mapping of COs with POs:**

| <b>PO<br/>CO</b> | <b>PO</b>   |             |             |             |             |             |             |             |             |
|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
| <b>CO1</b>       | S           | M           | S           | S           | L           | S           | M           | S           | S           |
| <b>CO2</b>       | S           | M           | S           | S           | L           | S           | M           | S           | S           |
| <b>CO3</b>       | S           | M           | S           | S           | L           | S           | M           | S           | S           |
| <b>CO4</b>       | S           | M           | S           | S           | L           | S           | M           | S           | S           |
| <b>CO5</b>       | S           | M           | S           | S           | L           | S           | M           | S           | S           |

**S-Strong, M-Medium, L-Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title : B.Sc. MATHEMATICS**

**Course Title : ANALYTICAL SOLID GEOMETRY**

**Course Code : 22UMAC4**

**Hours / Week:4**

**Semester : II**

**Credits :4**

**Course Objectives:**

1. To train in visualizing ideas in three dimensions.
2. To acquire practical knowledge about plane, straight line, spheres, cone, cylinder and conicoids in three dimensionals.
3. To develop the skill of solving problems related to plane, straight line, spheres, cone, cylinder and conicoids in three dimensionals.

**SYLLABUS**

**Unit - I(Hours : 12)**

**Plane**

First degree equation - Determination of a plane - Plane perpendicular to a given direction - Planes parallel to given lines and through given points - Equation  $P + \lambda P' = 0$  - Second degree homogeneous equation - Co planarity of the lines through a point - Perpendicular to a plane - Position of points with reference to a plane - Bisector planes of the angles between two given planes - Volume of a tetrahedron.

Chapter 3 (Sections 3.1 - 3.12, Vector methods are to be excluded )

Real life applications of Analytical solid Geometry

Web Link: <https://www.youtube.com/watch?v=W1Vz5qpNLNk>

**Unit – II( Hours : 12)**

**Straight Line**

Equation of a straight line - Symmetrical form - Conditions for various situations of a line - Co planarity of the two lines.

Chapter 4 (Sections 4.1 & 4.2, Vector methods are to be excluded)

Problems on Symmetrical form of a straight line

Web Link:[https://www.youtube.com/watch?v=\\_eGttH476IA](https://www.youtube.com/watch?v=_eGttH476IA)

**Unit – III(Hours : 12)**

**Straight Line**

Angle between a plane and a line - Projection of a line - Image of a point in a plane - Projection and image of a line in a plane - Perpendicular drawn to a line - Shortest distance between two skew lines - Foot of the common perpendicular - Equations of the plane containing the shortest distance - Line intersection the given line - Lines of intersection of three planes - Equation of two given skew lines - Surface generated by the straight line.

Chapter 4 (Sections 4.3 - 4.11, Vector methods are to be excluded)

Analysing intersection of three planes through problems

Web Link:<https://www.youtube.com/watch?v=duFRYId7kNU>

**Unit – IV(Hours : 12)**

**Sphere**

Equation of a sphere - Standard equation of a sphere - Results based on the properties of a sphere - Tangent plane to a sphere - Radical plane - Equation of a circle on a sphere - Equations  $S + \lambda P = 0$  and  $S + \lambda S' = 0$ .

Chapter 5 (Sections 5.1 - 5.8, Vector methods are to be excluded)

Problems of Equation of a sphere

Web link: <https://www.youtube.com/watch?v=1ywIh2LO4ug>

**Unit – V(Hours : 12)****Cone, Cylinder and Conicoids**

Cone - Equation of a Right circular cone - Cone whose vertex is at the origin - Cone with vertex at  $(\alpha, \beta, \gamma)$ - Quadric Cone with Vertex at the origin - Intersection of a cone by a plane - Three mutually perpendicular generators - General Quadric Cone - Cylinder - Equation of a cylinder - Right circular cylinder - Quadric surfaces- Conicoids - Standard equations of central conicoids - Enveloping cone - Tangent Plane.

Chapter 6 (Sections 6.1 - 6.13, Vector methods are to be excluded)

Problems of Equation of a sphere

Web link: <https://www.youtube.com/watch?v=-Q1VTXiWrZg>

**Book for study:**

P. Duraipandian, Laxmi Duraipandian, D. Muhilan, Analytical Geometry-3D, Emerald Publishers.

**Books for Reference:**

1. Shanthi Narayanan and Mittal P.K, Analytical Solid Geometry, 16<sup>th</sup> Edition S. Chand and Co., New Delhi.
2. P. Duraipandian & others, Analytical Geometry 3 Dimensional.

**Note:** Questions to be taken only from the text book

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | assimilate the basic concepts of Analytical solid geometry  | K-1             |
| 2.        | understand the notions of Plane, Straight line, Sphere, Cone Cylinder and Conicoids and solve related problems              | K-2, K-3        |
| 3.        | inspect the properties of sphere, tangential sphere, general quadratic cone, quadratic surfaces                             | K-4             |
| 4.        | obtain the conditions for various situations of a line, Coplanarity of two lines and Surface generated by the straight line | K-3             |
| 5.        | analyze the problems on Straight lines, Cone, Cylinder and Conicoids  | K-4             |

**K-1 : Recall, K-2 : Understand, K-3 : Apply, K-4 : Analyse, K-5 : Evaluate, K-6 : Create**

**Mapping of COs with POs :**

| CO \ PO | PO   |      |      |      |      |      |      |      |      |
|---------|------|------|------|------|------|------|------|------|------|
|         | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
| CO1     | S    | -    | S    | S    | M    | S    | S    | S    | S    |
| CO2     | S    | -    | S    | S    | M    | S    | S    | S    | S    |
| CO3     | S    | -    | S    | S    | M    | S    | S    | S    | S    |
| CO4     | S    | -    | S    | S    | M    | S    | S    | S    | S    |
| CO5     | S    | -    | S    | S    | M    | S    | S    | S    | S    |

**S - Strong, M - Medium, L - Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title: SKILL BASED II–ANALYTICAL GEOMETRY WITH  
GEOGEBRA – PRACTICAL**

**Course Code: 22UMASQC2**

**Semester: II**

**Hours / Week: 2**

**Credits: 2**

**Course Objectives**

1. To trace various conics and analyse certain properties of them using Geogebra
2. To construct three dimensional images and finding their key specifications using Geogebra.

**SYLLABUS**

**Unit- I**

Classification of Quadratic equations representing lines, Parabola, Ellipse and Hyperbola.

**Unit - II**

Tracing the conic when its equation is given.

**Unit- III**

Reflection property of Parabola, Reflection property of Ellipse, Reflection property of Hyperbola.

**Unit - IV**

Tracing Spheres, Tracing Cylindrical surfaces.

**Unit V:**

Graphing quadratic surfaces.

**Books for Study (Manual):**

1. Steve Phelps, An Introduction to Geogebra, Geogebra Institute of Ohio Madeira High School, University of Cincinnati
2. "Geogebra Manual, The official manual of Geogebra"

**Web Resources:**

1. <https://www.geogebra.org/m/ZMXBaxRY>
2. <https://www.geogebra.org/m/DS6pbceB>
3. <https://www.geogebra.org/m/m6cz5fqR>

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>1.</b>        | know the basic concepts of lines, Parabola, Ellipse and Hyperbola.              | <b>K-1</b>             |
| <b>2.</b>        | acquire knowledge about reflection property of Parabola, Ellipse and Hyperbola. | <b>K-2</b>             |
| <b>3.</b>        | trace the conic by using quadratic equations                                    | <b>K-3</b>             |
| <b>4.</b>        | use Geogebra to trace Spheres and Cylindrical surfaces.                         | <b>K-3</b>             |
| <b>5.</b>        | apply Geogebra for Graphing quadratic surfaces                                  | <b>K-3</b>             |

**K-1:Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create**

**Mapping of COs with POs:**

| CO \ PO | PO  |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1     | S   | L   | S   | M   | M   | S   | S   | S   | S   |
| CO2     | S   | L   | S   | M   | M   | S   | S   | S   | S   |
| CO3     | S   | M   | S   | S   | M   | S   | S   | S   | S   |
| CO4     | S   | M   | M   | S   | S   | S   | S   | S   | S   |
| CO5     | S   | S   | S   | S   | S   | S   | S   | S   | S   |

**S - Strong, M - Medium, L - Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. COMPUTER SCIENCE**

**Course Title : ALLIED MATHEMATICS - I**

**Course Code : 22UCSAC1**

**Hours / Week: 5**

**Semester : I**

**Credits : 5**

**Course Objectives:**

1. To acquire knowledge about the rank of a matrix, characteristic roots and characteristic vectors.
2. To gain knowledge about the various concepts on matrices & theory of equations.
3. To acquire knowledge on solving problems by Numerical methods.

**SYLLABUS**

**Unit - I (Hours : 15)**

**Matrices:**

Rank of a matrix, Elementary transformation, Equivalent matrices, Finding the rank of a matrix using elementary transformations (up to third order - simple problems) Characteristic equation of a matrix, Characteristic vectors of a matrix, Cayley - Hamilton's theorem (Statement only), Verification of Cayley - Hamilton theorem. (Examples 3-16 are to be excluded)  
Chapter 5 (Page No: 5.25 – 5.37, 5.50 – 5.54, 5.61-5.75)

**Unit – II (Hours : 15)**

**Theory of Equations:**

Relation between the roots and coefficients of an equation, Imaginary and irrational roots, Symmetric functions of the roots of an equation in terms of its coefficients (up to cubic equation) and reciprocal equations.  
Chapter 6 (Page No: 6.2 – 6.37)

**Unit – III (Hours : 16)**

Transformation of equation (Definition only), Multiplication of roots by  $m$  (Definition only) Diminishing the roots of an equation, Removal of term, Descart's rule of signs, Descart's rule of signs for negative roots of an equation, Horner's method, Newton's method of evaluating a real root to given decimal places.  
Chapter 6 (Page No: 6.38, 6.49 – 6.67)

**Unit – IV (Hours : 14)**

The solution of Numerical Algebraic and Transcendental equations - Bisection method - Method of Successive approximations – Regula Falsi method - Newton's method.  
Solution of Simultaneous Linear Algebraic Equations: Gauss-Elimination Method – Gauss-Jordan Elimination Method.  
Chapter 3 (Page No: 69 - 98) (Example problems only)  
Chapter 4 (Page No: 112 - 126) (Example problems only)

**Unit – V (Hours : 15)**

Numerical Differentiation and Numerical Integration: Newton's forward difference, Newton's backward difference formula to compute the derivative – Derivative using Stirling's formula - To find maxima and minima of the function given the tabular values - A general quadrature formula for equidistant ordinates - Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighths rule. (Geometrical interpretation, Truncation error in Trapezoidal rule, Romberg's method – Weddle's rule and Truncation error in Simpson's rule are to be excluded)  
Chapter 9 (Page No: 281 - 296, 300 - 320) (Example problems only - Examples 7 & 8 in Numerical Differentiation are excluded)

**Books for study:**

1. P.R.Vittal - Allied Mathematics, Margham Publications, Chennai (for Units I, II & III)
2. P.Kandasamy, K.Thilakavathy, K.Gunavathy -Numerical Methods,2003 Edition (for Units IV & V).

**Book for Reference:**

1. H.C. Saxena - Finite Differences and Numerical Analysis, S. Chand Publishers, 2005.
2. T.K. Manickavasagam Pillai & others – Algebra, Volume I, S.V. Publications, 1985.

**Web Resources:**

1. <https://books.googlea.co.in/books?id=4C4rDAAAQBAJ&pg=PR1&dq=allied+mathematics+and+numerical+method&hl=en&sa=X&ved=0ahUKEwiykt2fxorbAhVFeiskHcA7CSMQ6AEIJzAB#v=onepage&q=allied%20mathematics%20and%20numerical%20methods&f=false>
2. <https://www.sigc.edu>AlgebraandCalculus>

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | learn the concepts on Matrices ,Theory of equations and Numerical methods.  | K-1             |
| 2.        | use elementary transformation to find rank of a matrix , characteristic roots and corresponding characteristic vectors for a square matrix, apply Newton's and Horner's method to find a real root of polynomials.        | K-3             |
| 3.        | analysethe importance of real and complex polynomials and learn various methods of obtaining roots.   | K-4             |
| 4.        | understand the various methods to obtain numerical solution of algebraic and transcendental equations and simultaneous linear algebraic equations,various formula on Numerical differentiation and Numerical integration. | K-2             |
| 5.        | apply the acquired knowledge to obtain numerical solution of algebraic and transcendental equations, simultaneous linear algebraic equations and differential equations.  | K-3             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. STATISTICS**

**Course Title : ALLIED MATHEMATICS - I**

**Course Code :22USTAC1**

**Hours / Week:5**

**Semester : I**

**Credits :5**

**Course Objectives:**

1. To acquire knowledge in theory of equations, Differential calculus and Differential equations.
2. To understand the method of solving algebraic equations using transformation of equation.
3. To promote problem solving ability in differential equations.

**SYLLABUS**

**Unit – I (Hours : 15)**

**Theory of Equations**

Relation between the roots and coefficients of an equation, Imaginary and irrational roots, Symmetric functions of the roots of an equation in terms of its coefficients (up to cubic equations) and Reciprocal equation.

Chapter 6 (Page No : 6.2 – 6.37)

**Unit – II (Hours : 15)**

Transformation of equation (Definition only), Multiplication of roots by  $m$ (Definition only), Diminishing the roots of an equation, Removal of a term, Descartes' rule of sign, Descartes rule of signs for negative roots of an equation, Horner's method, Newton's method of evaluating a real root correct to given decimal places.

Chapter 6 (Page.No : 6.38 - 6.67)

**Unit – III (Hours : 15)**

**Differential Calculus**

Angle between the radius vector and the tangent, Angle of intersection of two curves, Length of perpendicular from the pole to the Tangent, Pedal equation, Cartesian formula for radius of curvature, Parametric formula for radius of curvature.

Chapter 10 & 11(Page.No : 10.1 – 10.23, 11.1 – 11.22)

**Unit – IV (Hours : 15)**

**Ordinary Differential Equations**

Second order differential equations with constant coefficients, Finding particular integral for the function  $f(x)e^{ax}$ ,  $\cos ax$ ,  $\sin ax$ ,  $\sinh ax$ ,  $\cosh ax$ ,  $x^m$ ,  $e^{ax}v$  where  $v$  is any function of  $x$ , Linear homogeneous equation and Variation of parameter.

Chapter 23 & 24 (Page No: 23.1 – 23.32, 24.1 – 24.23)

**Unit – V (Hours : 15)**

**Partial Differential Equations**

Elimination of arbitrary constants, Elimination of arbitrary functions, Definitions – complete solution, singular solutions, General solutions, Standard types, Lagrange's linear partial differential equations (Charpit's method to be excluded).

Chapter 26 (Page No: 26.1 – 26.40, 26.44 – 26.58)

**Book for study:**

P.R. Vittal - Allied Mathematics, Margham Publications, Chennai-17.



**Book for Reference:**

T.K.Manicavachagam Pillai, T.Natarajan& K.S. Ganapathy - Algebra Volume-I, S.Viswanathan Publishers, Pvt. Ltd, 2004.

**Web Resources :**

1. <http://www.universityofcalicut.info/SDE/VI%20Sem.%20B.Sc%20Maths%20%20Addition%20Course%20in%20lie%20of%20Project%20Theory%20of%20equations%20&%20fuzzy%20set.pdf>
2. [https://sol.du.ac.in/pluginfile.php/4111/mod\\_resource/content/1/B.A.%20st%20m%204\\_1-7\\_.pdf](https://sol.du.ac.in/pluginfile.php/4111/mod_resource/content/1/B.A.%20st%20m%204_1-7_.pdf)

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | learn the concepts of matrices, theory of equations, differential calculus, ordinary and partial differential equations   | K-1             |
| 2.        | analyse various methods to find roots of polynomial equation and inspect Horner's method and Newton's method to find approximate real roots                           | K-4             |
| 3.        | understand the concept of angle between the radius vector and the tangent, radius of curvature, pedal equation and Descartes rule of signs and solve related problems | K-2,K-3         |
| 4.        | solve specific types of ordinary and partial differential equations.  | K-3             |
| 5.        | analyse the method of Variation of parameters to solve ordinary differential equations, Lagrange's method to solve partial differential equations                     | K-4             |

**K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. COMPUTER SCIENCE/B.Sc STATISTICS**

**Course Title : ALLIED MATHEMATICS - II**

**Course Code :22UCSAC2/22USTAC2**

**Hours / Week:5**

**Semester : II**

**Credits :5**

**Course Objectives:**

1. To acquire knowledge about the basic concepts and techniques of mathematical logic.
2. To gain knowledge about solving double and triple integrals.
3. To promote the problem solving skill in differential equations using Laplace transform.

**SYLLABUS**

**Unit - I (Hours : 15)**

**Mathematical Logic**

Logical Statement or Proposition - Type of Propositions - The Propositional Calculus - The Negation of a Proposition - Disjunction - Conjunction - Tautologies and Contradictions - Logical Equivalence - The Algebra of Propositions - Conditional Propositions - Converse, Inverse and Contrapositive Propositions - The Negation of a Conditional Proposition - Biconditional Propositions - Arguments.

Chapter 1 Page No: 1-16

**Unit – II(Hours : 15)**

**Trigonometry**

Expansions of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  ( $n$  being a positive integer), Expansions for  $\cos^n\theta$  and  $\sin^n\theta$  in terms of multiples of  $\theta$ , Express  $\cos n\theta$  in terms of cosines of multiples of  $\theta$  ( $n$  is a positive integer), Expansions of  $\sin\theta$  and  $\cos\theta$  in ascending powers of  $\theta$ , Expansion of  $\tan\theta$ .

Chapter 14 (Page No: 14.1-14.30)

**Unit –III(Hours : 16)**

**Integral Calculus**

Multiple Integrals Evaluation of double integrals, Double integral in polar co-ordinates, Triple integrals, Change of order of integration.

Chapter 20 (Page No: 20.1 – 20.32)

**Unit –IV(Hours : 15)**

**Laplace Transform**

Definition, Laplace transform of elementary functions, Linearity property, Shifting property, Change of scale property, Laplace transform of derivatives, Laplace transform of integrals.(Periodic functions to be excluded).

Chapter 27 (Page No: 27.2 – 27.20)

**Unit –V(Hours : 14)**

Inverse Laplace transform, Solving differential equations using Laplace transform. (Simultaneous equations are to be excluded).

Chapter 27 (Page No: 27.24– 27.57) (Section 5 : Examples 1-10, Exercise IV : 1-26 only)

**Book for study:**

1. B. S. Vatsa and Suchi Vatsa - Discrete Mathematics, New Age International Publishers, New Delhi (for Unit-I).
2. P.R. Vittal - Allied Mathematics, Margham Publications, Chennai-17(for Unit-II, III, IV & V).

**Books for Reference:**

1. S. Narayanan and T.K. ManicavachagomPillay, Trigonometry, S. Viswanathan Publishers, Pvt. Ltd.,2009.
2. S. Narayanan and T. K. ManicavachagomPillay, Differential Equation and its Applications, S. Viswanathan Publishers Pvt Ltd, Ninth edition,2009

**Web Resources :**

1. [https://www.math.ucdavis.edu/~anne/WQ2007/mat67-Notes\\_on\\_Matrices.pdf](https://www.math.ucdavis.edu/~anne/WQ2007/mat67-Notes_on_Matrices.pdf)
2. <https://www.cms.waikato.ac.nz/~stokes/MATH102/trigOH.pdf>
3. <http://www.math.northwestern.edu/~scanez/courses/290/notes/lecture-notes-290-3.pdf>
4. [http://www.math.psu.edu/shen\\_w/250/NotesLaplace.pdf](http://www.math.psu.edu/shen_w/250/NotesLaplace.pdf)
5. [https://services.math.duke.edu/~yh89/teaching/Math353\\_15Summer\\_I/LectureNotes/lecture13.pdf](https://services.math.duke.edu/~yh89/teaching/Math353_15Summer_I/LectureNotes/lecture13.pdf)

**Note:**Questions to be taken only from the Text Book.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | Understand mathematical logic for expressions involving the logical connectives, properties of sets operations.  | <b>K-1</b>             |
| <b>2.</b>        | understand different trigonometric expansions, applications of characteristic equations, Laplace transforms, inverse Laplace transforms and solve related problems | <b>K-2,K-3</b>         |
| <b>3.</b>        | inspect the limits of functions applying trigonometric expansions and values of multiple integrals using rules of integration                                      | <b>K-3,K-4</b>         |
| <b>4.</b>        | interpret the properties of Laplace transforms and inverse Laplace transforms  | <b>K-4</b>             |
| <b>5.</b>        | analyse the method of solving differential equations applying Laplace transforms.  | <b>K-3,K-4</b>         |

**K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title : B.Sc. MATHEMATICS**

**Course Title :CALCULUS II**

**Course Code :22UMAC5**

**Hours / Week:4**

**Semester : III**

**Credits :4**

**Course Objectives**

1. To acquire knowledge about Bernoulli's formula for integration by parts, Reduction formulae and Beta-Gamma functions.
2. To know the evaluation of multiple integrals and its applications.
3. To make the students to familiarize with the concepts of Fourier Series.

**SYLLABUS**

**Unit –I( Hours: 12)**

Bernoulli's formula for Integration by parts, Reduction formulae, Beta and Gamma functions, Properties.

(Chapter 11, 13)

**Unit –II(Hours: 12)**

Relations between Beta and Gamma functions, Evaluations of definite integrals using Beta and Gamma functions, Double Integrals, Double Integral in polar co-ordinates.

(Chapter 13, 17)

**Unit – III(Hours: 12)**

Triple Integrals, Change of order of Integration, Applications of Double and Triple Integrals to Area, Volume and Centroid.

(Chapter 17)

**Unit – IV(Hours: 12)**

Fourier Series : Fourier series expansions of periodic functions with period  $2\pi$ , Fourier series for odd and even functions, Half range Fourier series.

(Chapter 22)

**Unit –V(Hours: 12)**

Fourier Transform – Fourier Sine and Cosine Transformations – Heat Flow Problems – Vibration of an Infinite String.

**Books for study:**

1. P.R.Vittal and V.Malini, Calculus, Margham publications, Chennai – 17(for Units I, II, III and IV).
2. P.R.Vittal, Allied Mathematics, Margham publications, Chennai- 17(for Unit IV).
3. <https://nptel.ac.in/courses/111/103/111103021> (for Unit V)

**Books for References:**

1. S. Narayanan and T.K. Manicavavhagom Pillai, Calculus (Volume II), S. Vishwanathan (Printers and Publishers) Pvt Limited, Chennai – 2011
2. Shanthi Narayan, Differential & Integral Calculus.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>1.</b>        | recognize the concepts of Bernoulli's formula, Beta and Gamma functions, double and triple integrals, Fourier series and Fourier transforms   | <b>K-1</b>             |
| <b>2.</b>        | understand relations between Beta and Gamma functions & double and triple integrals, basic properties of Fourier sine and cosine transforms and transformation of partial derivatives | <b>K-2</b>             |
| <b>3.</b>        | calculate trigonometric functions of sine and cosine and solve problems on vibration of an infinite string  | <b>K-3</b>             |
| <b>4.</b>        | analyse the properties of integration, applications of double and triple integrals to area, volume, centroid, Fourier series and Fourier Transforms                                   | <b>K-4</b>             |
| <b>5.</b>        | evaluate Beta and Gamma functions, double and triple integrals and solve heat flow problems   | <b>K-3, K-5</b>        |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mapping of COs with POs:**

| <b>CO \ PO</b> | <b>PO</b>  |            |            |            |            |            |            |            |            |
|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> |
| <b>CO1</b>     | S          | M          | S          | M          | S          | S          | S          | S          | S          |
| <b>CO2</b>     | S          | M          | S          | M          | S          | S          | S          | S          | S          |
| <b>CO3</b>     | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO4</b>     | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO5</b>     | S          | M          | S          | S          | S          | S          | S          | S          | S          |

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title: VECTOR ANALYSIS AND THEORY OF NUMBERS**

**Course Code :22UMAC6**

**Hours / Week:5**

**Semester: III**

**Credits:4**

**Course Objectives:**

1. To acquire the knowledge in divergence, curl and integration of vector point functions and number theory.
2. To understand the integral theorems in vector analysis
3. To analyse the evaluation of integrals.
4. To develop the ability in solving number theory problems.

**SYLLABUS**

**Unit -I ( Hours : 15)**

Vector functions, Limit of a vector function, Derivative of a vector function, Partial derivatives of vector functions and Successive differentiation.

Chapter 1 & <https://nptel.ac.in/courses/111/105/111105122/>

**Unit -II( Hours : 15)**

**Vector Differentiation**

Scalar and vector point functions, Level surfaces, Directional derivative of a scalar point functions, Gradient of a scalar point function, Summation notation for gradient, divergence and curl of a vector point function, Summation notation for divergence and curl, Laplacian differential operator and Examples.

Chapter 2

**Unit -III( Hours : 15)**

**Vector Integration**

Line integrals, Independence of path of integration, Conservative field and scalar potential, Line integral of a conservative vector, Surface integrals, Volume integrals, Cylindrical and spherical polar coordinates and Examples.

Chapter 3

**Unit -IV( Hours : 15)**

**Integral Theorems**

Gauss' divergence theorem, Integral theorems derived from the divergence theorem, Green's theorem in plane (without proof), Stokes' theorem, Integral theorems derived from Stokes' theorem, Operational meanings of  $\nabla$ ,  $\nabla \cdot$ ,  $\nabla \times$  in terms of surface integrals and Examples.

Chapter 4

**Unit -V (Hours : 15)**

Prime number, Composite number, decomposition of a composite number as a product of primes uniquely (without proof), Divisors of a given number N, Euler's function  $\phi(N)$ , formula for  $\phi(N)$ , Integral part of a real number, The highest power of a prime p contained in n!, The product of r consecutive integers is divisible by r! (without proof), Congruences, Numbers in arithmetical progression, Fermat's theorem (without proof), Generalisation of Fermat's theorem (without proof), Wilson's theorem (without proof). Simple problems.

Chapter 5 (Sections 1 - 9)

**Books for Study:**

1. P. Duraipandian and Laxmi Duraipandian, Vector Analysis, Emerald publishers, Chennai (For Unit I, II, III & IV),.
2. Dr. P.R. Vittal and V. Malini, Algebra, Analytical geometry & Trigonometry, Margham

publications, Chennai - 17(For Unit V).

**Books for Reference:**

1. P.R.Vittal and V. Malini - Vector Analysis ,Margham Publications, Chennai (For Units I,II , III& IV).
2. K.Viswanathan and S.Selvaraj - Vector Analysis , Emerald Publishers, Chennai(For Units I, II III& IV).
3. Kumaravelu and Susheela–Kumaravelu -Elements of Number Theory, Raja Sankar offset Printers, Sivakasi, 2002(For Unit V).

**Web Source:**

- 1.<https://nptel.ac.in/courses/111/105/111105122/> (For Unit I)

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | learn the concepts of vector functions,vector differentiation and integration,integral theorems and number theory.  | K-1             |
| 2.        | understand the concepts of directional derivative and gradient of scalar point function, divergence and curl of a vector point function, line,surface and volume integrals, Euler’s function,Integral part of a real number, the statements of Fermat’s theorem and Wilson’s theorem. | K-2             |
| 3.        | apply the acquired knowledge to solve the problems on vector differentiation , vector integration and number theory.  | K-3             |
| 4.        | analyse the properties of congruences and verify Gaussdivergence theorem,Green’s theorem and Stokes’ theorem.’  | K-4,K-6         |
| 5.        | prove theresults in vector functions,vector differentiation and vector integration and also prove integral theorems.  | K-5             |

**K-1 :Recall, K-2 :Understand, K-3 :Apply, K-4 :Analyse, K-5 :Evaluate, K-6 :Create**  
**Mapping of COs with POs :**

| PO<br>CO | PO  |     |     |     |     |     |     |     |     |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|          | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1      | S   | -   | M   | L   | L   | S   | S   | S   | S   |
| CO2      | S   | -   | M   | L   | L   | S   | S   | S   | S   |
| CO3      | S   | -   | M   | L   | L   | S   | S   | S   | S   |
| CO4      | S   | -   | M   | L   | L   | S   | S   | S   | S   |
| CO5      | S   | -   | M   | L   | L   | S   | S   | S   | S   |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title : ALLIED- MATHEMATICAL STATISTICS - I**

**Course Code :22UMAAC3**

**Hours / Week:5**

**Semester :III**

**Credits:5**

**Course Objectives:**

1. To understand the concept of random variables, Marginal and Conditional Probability distributions.
2. To acquire knowledge about Expectation, Variance and Characteristic functions.
3. To gain knowledge about the correlation and regression coefficients and different types of distributions with examples.

**SYLLABUS**

**Unit – I (Hours : 15)**

**Random Variables:** Definition, Discrete random Variable, Continuous random variable, Cumulative distribution, Two-dimensional random variable, Marginal probability distribution, Conditional probability distribution, Independent random variable.

**Mathematical Expectation:** Definition, Properties of expected values and examples.

Chapter 2 (Page No.: 2.1 -2.33)

Chapter 3 (Page No.: 3.1 -3.18)

**Unit – II(Hours : 15)**

**Variance:** Definition, properties of variance, Examples, Chebechev's inequality, examples

**Moment and Moment generating function:** Definition, Properties of moment generating functions and examples.

Chapter 4 (Page No.: 4.1 -4.25)

Chapter 5 (Page No.: 5.1 -5.17)

**Unit – III(Hours : 15)**

**Characteristic Functions:** Definition, Properties of characteristic function, Moments from the characteristic function, Inversion theorem, Probability generating function – Definition, Probability generating function of Binomial distribution and Poisson distribution, Additive Property, Relation between PGF and MGF and examples.

**Cumulants:** Definition, examples , Additive Property of Cumulants

**Conditional Expectation:** Definition, Theorems on conditional expectation and examples

Chapter 6 (Page No.: 6.1 - 6.46)

Chapter 7 (Page No.: 7.1 – 7.11)

**Unit – IV(Hours :15)**

**Correlation:** Definition, Rank correlation, Properties of correlation coefficient, Limitations, examples.

**Regression:** Derivation of regression lines, Properties of regression coefficients, examples.

Chapter 8 (Page No. : 8.2 Definition only, 8.20- 8.47)

Chapter 9 (Page No. : 9.1 - 9.24)

**Unit – V(Hours : 15)**

**Binomial Distribution :** Definition, Binomial frequency distribution and examples.

**Poisson Distribution:** Definition and examples of Poisson distribution.

**Normal Distribution :** Definition, standard normal probability distribution and examples.

**Uniform Distribution :** Definition and examples

Chapter 12 (Page No. : 12.1 -12.16)

Chapter 13 (Page No. : 13.1 -13.12)



Chapter 16 (Page No. : 16.1, 16.13 - 16.27)

Chapter 22 (Page No.: 17.1 - 17.4)

**Book for Study:**

P.R.Vittal, Mathematical Statistics, 2004, MaragathamPublishers.

**Books for Reference:**

S.C.Gupta and V.K.Kapoor - Fundamentals of Mathematical statistics , Sultan Chand and Sons, Pvt. Ltd.

**Web Resources:**

1. [www.iiserpue.ac.in](http://www.iiserpue.ac.in)>Sahoo textbook
2. [Spartan.ac.brocku.ca](http://Spartan.ac.brocku.ca/~jrbik)>~jrbik>Statistics
3. [www.maths.adelaide.edu.au](http://www.maths.adelaide.edu.au)>MSIII

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | nowledge Level |
|-----------|---|----------------|
| 1.        | understand the concepts of Random variables,expectation, Variance Moments, Characteristic functions, Conditional expectation,correlation and regression, Binomial, Poisson,Normal and Uniform distributions | K-2            |
| 2.        | apply Mathematical statistics in optimization problems appearing in Social sciences, Physical sciences, Life sciences and other disciplines.  | K-3            |
| 3.        | evaluate Mean, Variance and Moments for the distributions studied in the course using characteristic functions, MGF and PGF   | K-5            |
| 4.        | examine theproperties of expectation, variance correlation and regression solve the related problems  | K-4, k-3       |
| 5.        | solve the problems/ society connect problems using Binomial,Poisson,Normal and Uniform distributions  | K-6            |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mapping of COs with POs :**

| <b>PO<br/>CO</b> | <b>PO</b>  |            |            |            |            |            |            |            |            |
|------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                  | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> |
| <b>CO1</b>       | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO2</b>       | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO3</b>       | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO4</b>       | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO5</b>       | S          | M          | S          | S          | S          | S          | S          | S          | S          |

**S - Strong, M - Medium, L - Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title: DATA ANALYTICS WITH R - PRACTICAL**

**Course Code: 22UMASQC3**

**Hours / Week: 2**

**Semester: III**

**Credits: 2**

**Course Objectives**

1. To familiarize the operations on vectors and matrices using R studio
2. To understand computations on Big Data analytics and correlation using R studio

**SYLLABUS**

**UNIT - I**

**Getting started with R:** Installation – Getting started with the R interface

**R Nuts and Bolts** – Entering Input – Evaluation – R objects – Numbers – creating vectors – Matrices – Lists – Factors – Missing values – Data frames – Names – Summary

**UNIT – II**

**Getting Data In and Out of R**

Reading and Writing Data – Reading Data Files with read.table() – Reading in Larger Datasets with read.table – Calculating Memory Requirements for R Objects

**UNIT – III**

**Vectorized Operations**

Vectorized Matrix Operations

**Dates and Times**

Dates in R - Times in R - Operations on Dates and Times

**UNIT – IV**

**Coding Standards for R**

**Loop Functions**

Looping on the Command Line - lapply() - sapply() - split() - Splitting a Data Frame – tapply - apply() - Col/Row Sums and Means - Other Ways to Apply - mapply() – Vectorizing a function

**UNIT – V**

**Data Analysis Case Study: Changes in Fine Particle**

Synopsis – Loading and Processing the Raw Data – Results

**Book for Study**

Roger D. Peng, R Programming for Data Science.

**Web Resource:**

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://sites.calvin.edu/scofield/course/s/m143/materials/RcmdsFromClass.pdf&ved=2ahUKEwjD9butqeTyAhU-7XMBHf7nDvcQFnoECAMQBg&usq=AOvVaw2cqS0mj02xNYei1159OIq6>

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | understand the operations on vectors using R                                 | <b>K-2</b>             |
| <b>2.</b>        | interpret basic operations on matrices using R                               | <b>K-2</b>             |
| <b>3.</b>        | apply commands on data frames to understand various operations on it using R | <b>K-2 &amp;K-3</b>    |
| <b>4.</b>        | solve Correlation problems with R  | <b>K-3</b>             |
| <b>5.</b>        | analyse the operations on Big Data tables using R                            | <b>K-4</b>             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mapping of COs with POs:**

| <b>CO \ PO</b> | <b>PO</b>  |            |            |            |            |            |            |            |            |
|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> |
| <b>CO1</b>     | S          | L          | S          | M          | M          | S          | S          | S          | S          |
| <b>CO2</b>     | S          | L          | S          | M          | M          | S          | S          | S          | S          |
| <b>CO3</b>     | S          | M          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO4</b>     | S          | M          | M          | S          | S          | S          | S          | S          | S          |
| <b>CO5</b>     | S          | S          | S          | S          | S          | S          | S          | S          | S          |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.A/B.Sc/B.COM**

**Course Title : NON MAJOR ELECTIVE -I**

**Course Code :22UMANEC1**

**Semester :III**

**Hours / Week:2**

**Credits :2**

**Course Objectives:**

1. To introduce the basic concepts of mathematics.
2. To make the students to acquire knowledge on Geometry and solid and plane figures.
3. To initiate the students to find the volume and surface area of solids.

**SYLLABUS**

**Unit –I(Hours : 6)**

Operations on Numbers.

Section-I – Chapter 1 – Solved examples 1-32 only.(Page No. 1-9 only)

**Unit –II(Hours : 6)**

H.C.F. and L.C.M of Numbers.

Section-I – Chapter 2 ( Page No. 30-45 only)

**Unit –III(Hours : 6)**

Percentage

Section-I – Chapter 10 – Solved examples 1-33 only.( Page No.208-214 only)

**Unit –IV(Hours : 6)**

Area

Section-I – Chapter 24 – Solved examples 1-32 only.( Page No. 499-505 only)

**Unit – V(Hours : 6)**

Volume and Surface Area

Section-I – Chapter 25 – Solved examples 1-34 only.( Page No. 549-555 only)

**Book for Study:**

Dr. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations (Fully Solved) (Seventh Revised Edition), S.Chand & Company Pvt. Ltd.

**Book for Reference:**

Rajesh Verma, Fast Track Objective Arithmetic, Arihant Publications India Limited, New Delhi, Completely Revised Edition.

**Web Resources:**

1. <http://ncert.nic.in/ncerts/l/iemh113.pdf>
2. <https://yoursmahboob.files.wordpress.com/2016/12/quantramandeeepbook-1.pdf>

**Note:** Questions to be taken only from the Text Book.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>1.</b>        | recognise the notions of numbers, H.C.F and L.C.M percentage                                | <b>K-1</b>             |
| <b>2.</b>        | understand the concepts of area,volume and surface area                                     | <b>K-2</b>             |
| <b>3.</b>        | use the acquire knowledge to solve the problems in numbers, H.C .F and L.C.M and percentage | <b>K-3</b>             |
| <b>4.</b>        | Calculate the area , volume and surface area for geometrical shapes and solid shapes        | <b>K-3</b>             |
| <b>5.</b>        | Apply the concepts acquired to write the competitive examinations                           | <b>K-3</b>             |

**K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6Create**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title :DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**

**Course Code :22UMAC7**

**Hours / Week:4**

**Semester: IV**

**Credits :4**

**Course Objectives**

1. To provide with a carrier and systematic way of solving a given ordinary and partial differential equations.
2. To know about Laplace transforms and its application to differential equations.

**SYLLABUS**

**Unit-I(Hours : 12)**

Differential equation of first order but not of first degree, Exact differential equation, Total differential equation  $Pdx + Qdy + Rdz = 0$ , Second order differential equations with constant coefficients P.I. for the polynomial and  $e^{ax} V$ , where  $V$  is  $X^n$ ,  $\cos mx$ ,  $\sin mx$ , ( $m$  and  $n$  are constants).

Chapter 1(section 3.1-3.3,4,5.1-5.5,6.1,6.2,7.1-7.3)

Chapter 2(section 1.1,1.2,2,3,4)

Chapter 3(Section 7.1-7.4)

**Unit-II(Hours : 12)**

Differential equations of second order with variable co-efficients, Variation of parameters, Partial differential Equations : Formation of P.D.E. by elimination of arbitrary constants and functions, Solutions of P.D.E.

Chapter 2(section 8,8.1,8.2,9,10)

Chapter 4(section 1,2,2.1,2.2,3,4)

**Unit –III(Hours : 12)**

Standard Types :  $f(p,q) = 0$ ,  $f(x,p,q) = 0$ ;  $f(z,p,q) = 0$ ,  $f(x,p) = g(y,q)$ , Clairauts form, Lagrange's PDE :  $Pp + Qq = R$ , Charpit's method.

Chapter 4(section 1,2,2.1,2.2,3,4,5.1,5.2,5.3,5.4,6,6.1,7)

**Unit –IV( Hours : 12)**

Laplace Transforms, Inverse Laplace transform, Application of Laplace Transforms to differential equations, Simple problem - Solving simultaneous equations.

Chapter 5(section 1.1,1.2,2,3,4,5,6,7, 8,9,10,11,12)

**Unit-V(Hours : 12)**

Solution of Partial Differential Equations using Laplace Transform and Solution of Heat Equation and Wave Equation using Laplace Transform

**Books for study:**

1. S. Narayanan, T. K. Manicavachagam Pillay Differential Equations and Fourier Series and Fourier Transforms, Viswanathan (Printers and Publishers) Pvt. Ltd., 2004 (for Unit I to Unit IV).
2. <https://nptel.ac.in/courses/111/105/111105123> (for Unit V)

**Books for Reference:**

1. Arumugam and Isaac, Differential Equation, New Gamma Publishing House, Palayamkottai, 2003
2. M.D. Raisinghania, Ordinary and partial Differential Equations, S. Chand & Co.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | recognize the fundamental concepts of ordinary, partial differential equations, exact, total differential equations, Clairauts form, Lagrange's method, Charpit's method, Laplace transforms, heat equation and wave equation                              | K-1             |
| 2.        | solve ordinary and partial differential equations using standard techniques for exact, total differential equations and interpret the methods in solving second order linear differential equations with constant and variable coefficients, heat equation | K-3             |
| 3.        | apply the acquire knowledge of standard types, Clairauts form, Lagrange's method and Charpit's method to solve problems on differential equations  | K-3             |
| 4.        | evaluate related problems on variation of parameters, Laplace transforms and Inverse Laplace transforms  | K-5             |
| 5.        | analyse the applications of Laplace Transforms by differentiation and solve wave equation  | K-5             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**



**Mapping of COs with POs:**

| <b>CO \ PO</b> | <b>PO</b>  |            |            |            |            |            |             |            |            |
|----------------|------------|------------|------------|------------|------------|------------|-------------|------------|------------|
|                | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO 7</b> | <b>PO8</b> | <b>PO9</b> |
| <b>CO1</b>     | S          | M          | S          | S          | S          | S          | S           | S          | S          |
| <b>CO2</b>     | S          | M          | S          | S          | S          | S          | S           | S          | S          |
| <b>CO3</b>     | S          | M          | S          | S          | S          | S          | S           | S          | S          |
| <b>CO4</b>     | S          | M          | S          | S          | S          | S          | S           | S          | S          |
| <b>CO5</b>     | S          | M          | S          | S          | S          | S          | S           | S          | S          |

**S - Strong, M - Medium, L - Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title :B.Sc. MATHEMATICS**

**Course Title :OPERATIONS RESEARCH**

**Course Code :22UMAEC1**

**Semester:IV**

**Hours / Week:5**

**Credits :4**

**Course Objectives:**

1. To understand the concepts of solving Linear Programming Problem, Transportation and Assignment problems.
2. To develop the ability of solving the real world problem through Network Analysis.

**SYLLABUS**

**Unit I(Hours:15)**

**Linear Programming Formulation and Graphical method of the solution of a L.P.P**

Introduction, Requirements for employing LPP Technique, Mathematical Formulation of LPP&Graphical method of the solution of a L.P.P.

**General Linear Programming Problems – Simplex Methods**

General Linear Programming Problems, Canonical and Standard forms of LPP, The Simplex Method, The Simplex Algorithm, Artificial Variables Techniques, The Big M – Method&The Two Phase Method.

Chapter – 2- Sec: 2.1- 2.3 & 2.5( Page No: 2.1 – 2.28)

Chapter – 3- Sec: 3.1.1 - 3.1.4, 3.2, 3.2.1 & 3.2.2( Page No: 3.1 – 3.56)

**Unit II (Hours:15)**

**Transportation Model**

Introduction, Mathematical formulation of a Transportation Problem, Methods for finding initial basic feasible solution, Transportation Algorithm (or) MODI Method (modified distribution method) (Test for optimal solution), Degeneracy in Transportation problems and Unbalanced Transportation problems

Chapter – 7- Sec: 7.1- I, II , 7.2 - 7.4 ( Page No: 7.1 – 7.47)

**Unit III(Hours:15)**

**Assignment Problem**

Introduction, Assignment Algorithm (or) Hungarian Method, Unbalanced Assignment Models& Travelling Salesman Problem.

Chapter – 8- Sec: 8.1, 8.5, 8.6 & 8.9 ( Page No: 8.4 – 8.22, 8.33 – 8.49)

<https://nptel.ac.in/courses/111/107/111107128/>

**UnitIV(Hours:15)**

**Scheduling by PERT and CPM**

Introduction, Basic Terminologies, Rules for constructing a project network, Network Computations (Earliest completion time of a Project and Critical path), Floats, Programme Evaluation Review Technique : (PERT)& Basic differences between PERT and CPM.

Chapter – 15- Sec: 15.1 - 15.7(Page No: 15.1 – 15.46)

**UnitV (Hours:15)**

**Game Theory**

Introduction, Two person zero – Sum Games, The Maximin – Minimax Principle, Games without Saddle Points, Mixed Strategies, Dominance Property& Graphical Method for  $2 \times n$  or  $m \times 2$  games.

Chapter – 16- Sec: 16.1 - 16.4, 16.6 & 16.7 (Page No: 16.1 – 16.14, 16.20 – 16.39)

**Book for Study:**

1. Prof. V. Sundaresan, Prof. K.S. Ganapathy Subramanian, Prof. K. Ganesan - Resource Management Techniques, AR Publications, Chennai.

**Books for Reference:**

1. Kantiswarup, P.K. Gupta and Man Mohan, Operations Research (9th Edition), Sultan-Chand Publications.
2. Taha H.A, Operations Research: An introduction, 7th edition, Pearson Prentice Hall, 2002

**Web Resource:**

1. <https://nptel.ac.in/courses/111/107/111107128>

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | learn the concepts of L.P.P, Transportation model, Assignment problem, Project scheduling and Game theory.                           | K-1             |
| 2.        | formulate and analyse linear programming models of real life situations, construct a project network.                                | K-4, K-6        |
| 3.        | understand simplex algorithm, transportation algorithm, assignment algorithm, CPM and PERT techniques and two person zero sum games. | K-2             |
| 4.        | use acquired knowledge to solve problems on L.P.P, transportation model and assignment problems.                                     | K-3             |
| 5.        | apply CPM and PERT to solve problems on project scheduling and analyse graphical method to solve $2 \times n$ or $m \times 2$ games. | K-3, K-4        |

**K-1 : Recall; K-2 : Understand; K-3 : Apply; K-4 : Analyze; K-5 : Evaluate; K-6 : Create.**

**Mapping of COs with POs :**

| CO \ PO | PO  |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1     | S   | M   | S   | S   | S   | S   | S   | S   | S   |
| CO2     | S   | M   | S   | S   | S   | S   | S   | S   | S   |
| CO3     | S   | M   | S   | S   | S   | S   | S   | S   | S   |
| CO4     | S   | M   | S   | S   | S   | S   | S   | S   | S   |
| CO5     | S   | M   | S   | S   | S   | S   | S   | S   | S   |

**S - Strong, M - Medium, L - Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title : NUMBER THEORY**

**Course Code : 22UMAESC1**

**Hours / Week: 5**

**Semester: IV**

**Credits : 4**

**Course Objectives:**

1. To know about the basic concepts of number theory.
2. To get a complete grip of various concepts to present modern Mathematics in elementary terms.
3. To develop the skill of solving problems in number theory.

**SYLLABUS**

**Number Theory**

**Unit-I (Hours : 15)**

Peano's Axiom - Mathematical Induction - The Binomial Theorem - Early Number Theory.

**Unit-II (Hours : 15)**

Divisibility Theory in Integers - The Division Algorithm - The g.c.d. - Euclidean Algorithm - The Diophantine Equation  $ax + by = c$ .

**Unit-III (Hours : 15)**

Primes and their Distributions - The fundamental theorem of Arithmetic - The Sieve of Eratosthenes - The Goldbach Conjecture.

**Unit-IV (Hours : 15)**

The Theory of Congruence - Basic Properties of Congruence - Special Divisibility test - Linear Congruence.

**Unit-V (Hours : 15)**

Fermat's Theorem - Fermat's factorization method - The little theorem - Wilson's theorem.

**Book for Study:**

S.Kumaravelu and Susheela Kumaravelu, Elements of Number Theory, Nagercoil, 2002.

**Books for Reference:**

G.H. Hardy, Edward M. Wright, An Introduction to the Theory of Numbers, Andrew Wiles, Roger Heath Brown and Joseph Silverman.

**Web Resource :**

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

**Note:** Questions to be taken only from the text books

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | recall the basic concepts in number theory   | <b>K-1</b>             |
| <b>2.</b>        | understand the concepts of divisibility theory in integers, the division algorithm, Euclidean algorithm and Diophantine equation $ax + by = c$ | <b>K-2</b>             |
| <b>3.</b>        | solve the problems using the Fundamental theorem of arithmetic   | <b>K-3</b>             |
| <b>4.</b>        | prove the properties of congruence and solve the related problems  | <b>K-3, K-5</b>        |
| <b>5.</b>        | analyse the Fermat's factorization method, the Little theorem & Wilson's theorem and acquire knowledge to apply them                           | <b>K-3, K-4</b>        |

**K-1:Recall, K-2 :Understand, K-3 :Apply, K-4 :Analyse, K-5 :Evaluate, K-6 Create**

**Mapping of COs with POs and PSOs:**

| <b>CO \ PO</b> | <b>PO</b>   |             |             |             |             |             |             |             |             |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
| <b>CO1</b>     | S           | S           | S           | -           | S           | S           | S           | S           | S           |
| <b>CO2</b>     | S           | S           | S           | -           | S           | S           | S           | S           | S           |
| <b>CO3</b>     | S           | S           | S           | -           | S           | S           | S           | S           | S           |
| <b>CO4</b>     | S           | S           | S           | -           | S           | S           | S           | S           | S           |
| <b>CO5</b>     | S           | S           | S           | -           | S           | S           | S           | S           | S           |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title : ALLIED- MATHEMATICAL STATISTICS - II**

**Course Code : 22UMAAC4**

**Hours / Week: 3**

**Semester : IV**

**Credits: 3**

**Course Objectives:**

1. To understand the concepts of sampling distribution and moments of t-distribution.
2. To acquire knowledge about statistical hypothesis and error values
3. To gain knowledge about the testing of significance for Large samples and Small samples

**SYLLABUS**

**Unit - I (Hours: 12)**

**Sampling Distribution:** Sampling distribution, Sampling distribution of  $\bar{X}$ , chi-square distribution, MGF of  $X^2$  - distribution, characteristic function of  $X^2$ , Additive property, Relation between moments.

Student t distribution, Moments of t distribution, limiting form of t-distribution and properties F – distribution, Moments of F-distribution.

**Chapter 22 (Page No.: 22.1 - 22.40)**

**Unit – II (Hours: 12)**

**Estimation: Point Estimation:** Estimator and estimate, unbiased estimator, Examples, Efficiency, Cramer – Rao inequality, and Rao – Blackwell theorem, Method of maximum likelihood, Properties of ML estimators and Examples.

**Chapter 23 (Page No.: 23.1 - 23.25, 23.46 - 23.56)**

**UNIT – III (Hours: 12)**

**Large Samples:** Population, Parameter and statistic, sampling distribution, Characteristic of sampling distribution, standard error of the mean, test of hypothesis – Procedure, One tail test, two tail test, test for a specified mean, test for equality of two means, test for a specified proportion, test for equality of two proportions.

**Chapter 24 (Page No.: 24.1 – 24.41)**

**Unit – IV (Hours: 12)**

**Small samples:** t Test, uses of t – test, Properties of sampling distribution of t, Test for a specified Mean, Test of significance for the difference between two population means, confidence interval for small samples. F – test, Procedure for equality of two population variances.

**Chapter 25 (Page No. :25.1 –25.30)**

**Chapter 26 (Page No. :26.1 –26.12)**

**Unit - V (Hours: 12)**

**Small samples: chi-square test, Additive property, Pearsons' statistic, uses of  $X^2$ - test, Test for independence of Attributes, Test for a specified Population Variance, Test of Independence of attributes.**

**Chapter 27 (Page No.:27.1 – 27.46)**

**Book for Study:**

**P.R.Vittal - Mathematical Statistics, 2004 - Margham Publications.**

**Books for Reference:**

1. S. C. Gupta & V. K. Kapoor (2000), Fundamentals of Mathematical Statistics (A Modern Approach), 10th Edition, Sultan Chand & Sons
2. J. N. Kapur & H. C. Saxena, Mathematical Statistics, S Chand & Company
3. Richard W. Hamming (2004) Methods of Mathematics Applied to Calculus, Probability, and Statistics, Dover Publications, New York

**Web Resources:**

1. <https://ocw.mit.edu/courses/18-655-mathematical-statistics-spring-2016/>
2. <https://archive.nptel.ac.in/courses/111/105/111105043/>

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | learn the concepts of sampling distribution, Estimation and testing of hypothesis.   | K-1             |
| 2.        | understand the notions of Student t distribution, moments of chi-square, t-test and F-distribution..                       | K-3             |
| 3.        | estimate the error value and standard error for mean and test the hypothesis for them and validate the claims              | K-3             |
| 4.        | analyse the properties of Maximum Likelihood estimators, chi-square, t and F distributions and solve the related problems. | K-5             |
| 5.        | derive the distribution of chi-square, t and F distribution and defend its applications for small samples.                 | K-5             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mappings of CO with POs:**

| CO \ PO | PO  |      |      |      |     |     |      |     |     |
|---------|-----|------|------|------|-----|-----|------|-----|-----|
|         | PO1 | PO 2 | PO 3 | PO 4 | PO5 | PO6 | PO 7 | PO8 | PO9 |
| CO1     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO2     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO3     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO4     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO5     | S   | M    | S    | S    | S   | S   | M    | S   | S   |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title : B.Sc. MATHEMATICS**

**Course Title : ALLIED- MATHEMATICAL STATISTICS USING R  
PROGRAMMING - PRACTICAL**

**Course Code :22UMAAQC**

**Hours / Week:2**

**Semester : IV**

**Credits:2**

**Course Objectives:**

1. To provide a strong foundation on the practical applications of R-studio
2. To critically evaluate data and determine the most appropriate statistical models for specific scenarios
3. To apply the knowledge of regression analysis in solving real-world problems

**SYLLABUS**

**Unit – I:Data**

Starting R-Entering data with c- Data is a vector - Problems

**(Page No: 1-7)**

**Unit – II: Bivariate Data**

Handling bivariate categorical data, Handling bivariate data: categorical vs. numerical, Bivariate data: numerical vs. numerical, Linear regression, Problems.

**(Page No:19-22)**

**Unit – III Hypothesis Testing**

Testing a population parameter, Testing a mean, Tests for the median, Problems

**(Page No: 66-68)**

**Unit – IV: Chi Square Tests**

The Chi-Squared Distribution, Chi-Squared Goodness of Fit Tests, Chi-Squared Tests for Independence, Chi-Squared Tests for Homogeneity, Problems

**(Page No: 72-76)**

**Unit – V: Regression Analysis**

Simple Linear Regression Model-Testing the Assumption of the Model-Statistical Inference, Problems

**(Page No: 77-83)**

**Book for Study:**

Simple R - Using R for Introductory Statistics by John Verzani



**Books for Reference:**

Statistics – An Introduction using R by Michael J. Crawley, Wiley Publications

**Web Resources:**

<https://www.geeksforgeeks.org/r-statistics/>

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | recall and understand the basics of R, including data entry, vectors and other computations   | K-1             |
| 2.        | apply the knowledge of R Studio to real-world problems with the use of chi-squared tests, correlation coefficients and regression analysis.                 | K-3             |
| 3.        | analyze data and perform advanced statistical tests, such as hypothesis testing, chi-squared tests and regression analysis, to draw meaningful conclusions. | K-3             |
| 4.        | evaluate the appropriateness of various statistical data, including hypothesis testing and chi-squared tests  | K-5             |
| 5.        | create and execute complex statistical computations, including correlation and regression models, and report the findings,                                  | K-5             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mappings of CO with POs:**

| CO \ PO | PO  |      |      |      |     |     |      |     |     |
|---------|-----|------|------|------|-----|-----|------|-----|-----|
|         | PO1 | PO 2 | PO 3 | PO 4 | PO5 | PO6 | PO 7 | PO8 | PO9 |
| CO1     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO2     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO3     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO4     | S   | M    | S    | S    | S   | S   | M    | S   | S   |
| CO5     | S   | M    | S    | S    | S   | S   | M    | S   | S   |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title : OPTIMIZATION TECHNIQUES WITH TORA-PRACTICAL**

**Course Code : 22UMASQC4**

**Hours / Week: 2**

**Semester : IV**

**Credits: 2**

**Course Objective:**

To impart knowledge on solving Operations Research problems using computer with TORA software.

**SYLLABUS**

**Unit -I**

Solving Linear Programming Problems – Simplex Method

**Unit –II**

Solving Transportation Problems- North –West corner rule, Least cost method, Vogel's approximation method, Test for optimal solution by Modimethod.

**Unit –III**

Solving Assignment Problem by Hungarian method.

**Unit –IV**

Solving Network Analysis Problems-CPM, PERT

**Unit –V**

Solving Game theory problems – Two person zero – Sum Games, Graphical Method for  $2 \times n$  or  $m \times 2$  games.

**Book for Study:**

Prof. V. Sundaresan, Prof. K.S. Ganapathy Subramanian and Prof. K. Ganesan, Resource Management Techniques (Operations Research), Fourth Revised Edition, A.R. Publications, Chennai.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | understand the basic concepts of TORA software   | <b>K-2</b>             |
| <b>2.</b>        | interpret and apply commands in TORA to solve L.P.P and transportation problems .                    | <b>K-2, K-3</b>        |
| <b>3.</b>        | use TORA for solving problems on L.P.P and transportation problems                                   | <b>K-3</b>             |
| <b>4.</b>        | make use of commands in TORA to solve problems on project scheduling by PERT and CPM and Game theory | <b>K-3</b>             |
| <b>5.</b>        | solve problems on project scheduling and Games & Strategies by using TORA                            | <b>K-3</b>             |

**K-1 : Recall; K-2 : Understand; K-3 : Apply; K-4 : Analyze; K-5 : Evaluate; K-6 : Create.**

### Mapping of COs with POs

| CO \ PO | PO   |      |      |      |      |      |      |      |      |
|---------|------|------|------|------|------|------|------|------|------|
|         | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
| 1.      | S    | M    | S    | S    | S    | S    | S    | S    | S    |
| 2.      | S    | M    | S    | S    | S    | S    | S    | S    | S    |
| 3.      | S    | M    | S    | S    | S    | S    | S    | S    | S    |
| 4.      | S    | M    | S    | S    | S    | S    | S    | S    | S    |
| 5.      | S    | M    | S    | S    | S    | S    | S    | S    | S    |

S - Strong, M - Medium, L - Low

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title : B.A/B.Sc/B.COM**

**Course Title : NON MAJOR ELECTIVE II**

**CourseCode : 22UMANEC2**

**Hours / Week:2**

**Semester :IV**

**Credits:2**

**Course Objectives:**

1. To introduce the basic concepts of Mathematics.
2. To make them to find simple and compound interest.
3. To promote the problem solving ability to write the competitive examinations.

**SYLLABUS**

**Unit – I(Hours : 6)**

Averages, Problems on Numbers.

Section-I – Chapter 6 – Solved examples 1-15 only (Page No. 139-141), Chapter 7 - Solved examples 1-15 only (Page No.161-163).

**Unit – II(Hours : 6)**

Profit and Loss

Section-I – Chapter 11 – Solved examples 1-29 only (Page No.251-256).

**Unit – III(Hours : 6)**

Ratio and Proportion, Partnership

Section-I – Chapter 12 – Solved examples 1-7 only (Page No.294-296), Chapter 13 (Page No.311-325).

**Unit – IV(Hours : 6)**

Simple Interest, Compound Interest

Section-I – Chapter 21 – Solved examples 1-12 only (445-447), Chapter 22 – Solved examples 1-15 only(466-470).

**Unit – V(Hours : 6)**

Odd Man Out and Series

Section-I – Chapter 35 (Page No.649-657).

**Book for Study:**

Dr. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations (Fully Solved) (Seventh Revised Edition), S. Chand & Company Pvt.Ltd.

**Book for Reference:**

Abhijit Guha, Quantitative Aptitude for All Competitive Examinations, McGraw Hill Education, Sixth edition.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | recognise the notions on numbers and averages  | <b>K-1</b>             |
| <b>2.</b>        | understand the concepts of profit and loss, ratio and proportion,partnership,simple interest and compound interest | <b>K-2</b>             |
| <b>3.</b>        | apply the concepts obtained in the course to solve real life problems  | <b>K-3</b>             |
| <b>4.</b>        | infer solutions about the partnership and rate of proportionality appropriately.                                   | <b>K-4</b>             |
| <b>5.</b>        | analyse the problems on profit and loss and inspect the odd man out series.  | <b>K-4</b>             |

**K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6Create**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.COM**

**Course Title : ALLIED BUSINESS MATHEMATICS**

**Course Code :22UCOAC3**

**Semester :III**

**Hours / Week:5**

**Credits:5**

**Course Objectives:**

1. To gain knowledge about Matrices and Determinants.
2. To acquire knowledge about the fundamental rules of Differentiation and integration.
3. To inculcate the application of derivatives and integration in business as a rate measures and in the field of Marginal analysis.
4. To acquire knowledge about Linear Programming Problem and solving of them.
5. To know about how to transport various quantities from various origins to different destinations with the minimum cost.

**SYLLABUS**

**Unit -I(Hours : 17)**

Definition of a matrix, Notation, Order of a matrix, Types of matrices, Matrix Operations-I, System of linear equations, Determinants, Evaluation (Method 2, Properties of determinants are to be excluded) Cramer's rule, (Product of determinants is to be excluded) Minor and Cofactor, Matrix operations-II.

(Page no.162-181, 184-188, 190-199 only)

**Unit –II(Hours : 15)**

**Limit and Differentiation**

Differentiation - Derivatives of standard functions from first principle (All the derivations and differentiation of parametric form are to be excluded), Successive differentiation, Uses of the derivative.

Chapter 6 (Page no: 267-286, 289-303 only)

Chapter 7 (Page no: 304-325 only)

**Unit –III(Hours : 14)**

**Integration**

Indefinite integrals, Standard forms, Determination of C, Definite integrals, Method of substitution, Method of partial fractions, Method of integration by parts, Uses in Economics.

Chapter 8 (Page no: 326-342, 346-352 only)

**Unit –IV(Hours : 17)**

Graphical method, A few important terms, Simplex method. (Simple problems involving slack variables only)

Chapter 9 (Page no: 366-401 only)

**Unit – V(Hours : 12)**

Transportation problems (Initial basic feasible solution only), Assignment problems (Simple problems only)

**Books for Study:**

1. PA. Navnitham - Business Mathematics, Jai Publishers. Trichy-21. (For Units I-IV).
2. Kantiswarup, P.K. Gupta and Man Mohan, Operations Research, Eighth Edition. (for Unit V).

**Books for Reference:**

1. Dharmapadam, Business Mathematics, Visvanathan .S Ltd Publications, 1991.
2. V.Sundaresan, Resource Management Techniques AR Publications, 2015.

**Web Resources:**

1. <http://ncert.nic.in/ncerts/l/lemh201.pdf>
2. <http://econweb.ucsd.edu/~jsobel/172aw02/notes8.pdf>

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students should be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | learn the basic concepts of matrix, types of matrix, differentiation, integration and LPP  | <b>K-1</b>             |
| <b>2.</b>        | understand the concepts of determinants, Cramer's rule, inverse of matrix, successive differentiation ,indefinite, definite integrals  | <b>K-2</b>             |
| <b>3.</b>        | apply the acquire knowledge to solve problems on determinants, Cramer's rule, inverse of matrix, successive differentiation ,indefinite, definite integrals                        | <b>K-3</b>             |
| <b>4.</b>        | analyse the uses of derivatives and uses of integration in economics and enhance the concepts of graphical method, simplex algorithm, transportation methods and assignment method | <b>K-4</b>             |
| <b>5.</b>        | solve the problems by using graphical method, simplex method, transportation methods and assignment method   | <b>K-3</b>             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |                                 |                       |
|------------------------|---------------------------------|-----------------------|
| <b>Programme Title</b> | <b>:B.Sc. PHYSICS/CHEMISTRY</b> |                       |
| <b>Course Title</b>    | <b>: ALLIED MATHEMATICS - I</b> |                       |
| <b>Course Code</b>     | <b>: 22UPHAC3/22UCHAC3</b>      | <b>Hours / Week:5</b> |
| <b>Semester</b>        | <b>: III</b>                    | <b>Credits:5</b>      |

**Course Objectives:**

1. To acquire knowledge in Theory of equations, Differential calculus and Differential equations
2. To understand the method of solving algebraic equations using transformation of equation
3. To promote problem solving ability in differential equations.

**SYLLABUS**

**Unit – I(Hours: 15)**

**Theory of Equations**

Relation between the roots and coefficients of an equation, imaginary and irrational roots , Symmetric functions of the roots of an equation in terms of its coefficients(upto cubic equations), and Reciprocal equation.

Chapter 6 (Page. No.: 6.2 – 6.37)

**Unit – II(Hours: 15)**

Transformation of equation (Definition only), Multiplication of roots by m, Diminishing the roots of an equation, Removal of a term, Descartes' rule of sign, Descartes' rule of sign for negative roots of an equation, Horner's method, Newton's method of evaluating a real root correct to given decimal places.

Chapter 6 (Page.No : 6.49 – 6.67 )

**Unit – III(Hours: 15)**

**Differential Calculus**

Angle between the radius vector and the tangent, Angle of intersection of two curves, length of perpendicular from the pole to the tangent, Pedal equation, Cartesian formula for radius of Curvature, Parametric formula for radius of curvature, Radius of curvature in Polar Coordinates, Radius curvature for pedal curve, Radius of curvature for polar tangential curve.

Chapter 10 & 11 (Page.No : 10.1 – 10.23, 11.1 – 11.33)

**Unit – IV(Hours: 15)**

**Ordinary Differential Equations**

Second order linear differential equations with constant coefficients, Finding particular integral for  $(D)y = F(x)$  when the function  $F(x) = e^{ax}$ ,  $\cos ax$ ,  $\sin ax$ ,  $\sinh ax$ ,  $\cosh ax$ ,  $x^m$ ,  $e^{ax}v$  where  $v$  is any function of  $x$ , Linear homogeneous equation and variation of parameters.

Chapter 23 & 24 (Page. No: 23.1 – 23.32, 24.1 – 24.23)

**Unit – V(Hours: 15)**

**Partial Differential Equations**

Elimination of arbitrary constants, Elimination of arbitrary functions, Definitions – Complete solution, Singular solutions, General solutions, Standard types :  $F(p,q) = 0$ ,  $F(z, p, q) = 0$ ,  $f_1(x, p) = f_2(y, q)$  and Clairaut's form (simple problems only), Lagrange's linear partial differential equations.

Chapter 26 (Page.No : 26.1 – 26.40, 26.44 – 26.58)



**Book for Study:**

P.R. Vittal, Allied Mathematics, Margham Publications, Chennai – 17.

**Book for Reference:**

T.K.ManicavachagomPillai, T.Natarajan& K.S. Ganapathy, Algebra, Volume-I, S.Viswanathan Publishers, Pvt. Ltd, 2004.

**Note:** Questions to be taken only from the Text Books.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>1.</b>        | learn the concepts of matrices, theory of equations, differential calculus, ordinary and partial differential equations   | <b>K-1</b>             |
| <b>2.</b>        | analyse various methods to find roots of polynomial equation and inspect Horner's method and Newton's method to find approximate real roots                           | <b>K-4</b>             |
| <b>3.</b>        | understand the concept of angle between the radius vector and the tangent, radius of curvature, pedal equation and Descartes rule of signs and solve related problems | <b>K-2,K-3</b>         |
| <b>4.</b>        | solve specific types of ordinary and partial differential equations.  | <b>K-3</b>             |
| <b>5.</b>        | analyse the method of Variation of parameters to solve ordinary differential equations, Lagrange's method to solve partial differential equations                     | <b>K-4</b>             |

**K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |                                  |                       |
|------------------------|----------------------------------|-----------------------|
| <b>Programme Title</b> | <b>: B.Sc. PHYSICS/CHEMISTRY</b> |                       |
| <b>Course Title</b>    | <b>: ALLIED MATHEMATICS - II</b> |                       |
| <b>Course Code</b>     | <b>: 22UPHAC4/22UCHAC4</b>       | <b>Hours / Week:3</b> |
| <b>Semester</b>        | <b>: IV</b>                      | <b>Credits:3</b>      |

**Course Objectives:**

1. To acquire knowledge in integral calculus, fourier series and Laplace transform
2. To understand the method of doing problems using the above concepts.
3. To analysis the different methods of solving differential equations using Laplace transform

**SYLLABUS**

**Unit – I (Hours : 9)**

Integral Calculus: Multiple Integrals, Evaluation of double integrals, Double integral in polar co- ordinates.

**Chapter 20(Sections 20.1-20.17)**

**Unit - II (Hours : 9)**

Triple integrals, Change of order of integration. applications of double and triple integrals to area volume and centroid.

**Chapter 20(Sections 20.18 -20.44)**

**Unit - III (Hours : 9)**

**Fourier Series:** Definition, Finding Fourier series for a given periodic function with period  $2\pi$ , Fourier series for odd and even functions.

**Chapter 21 (Sections 21.1-21.40)**

**Unit -IV(Hours : 9)**

Laplace Transform: Definition, Laplace transform of elementary functions, Linearity property, Shifting property, Change of Scale property, Laplace transform of derivatives.

**Chapter 27 (Sections 27.1-27.20)**

**Unit -V(Hours : 9)**

Inverse Laplace transform, Solving differential equations using Laplace transform. (Simultaneous equations are to be excluded).

**Chapter 27 (Sections 27.23-27.57)(Section 5:Examples1-10 only,Exercise 4:1-26only)**

**Book for Study:**

P.R. Vittal, Allied Mathematics, Margham Publications, Chennai-1

**Book for Reference:**

S.Narayanan and T.K Manicavachagam Pillay, Calculus-Volume III,S.Viswanathan (Printers and Publishers), Pvt., Ltd, 2011.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | learn the notions of multiple integrals and Laplace transforms   | <b>K-1</b>             |
| <b>2.</b>        | Understand the change of order of integration, Fourier coefficients, odd and even functions and solved related problems. | <b>K-2,K-3</b>         |
| <b>3.</b>        | analyse the properties of integration to evaluate double and triple integrals and Fourier series.                        | <b>K-4</b>             |
| <b>4.</b>        | interpret the properties of Laplace transform, inverse Laplace transform and solve the related problems.                 | <b>K-4</b>             |
| <b>5.</b>        | apply Laplace transform and inverse Laplace transform to solve the differential equations                                | <b>K-3</b>             |

**K1-Recall ; K2-Understand; K3-Apply; K4-Analyse; k5-Evaluate; K6-Create.**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |   |                       |
|------------------------|---|-----------------------|
| <b>Programme Title</b> | <b>: B.Sc. PHYSICS/CHEMISTRY</b>        |                       |
| <b>Course Title</b>    | <b>: ALLIED MATHEMATICS - PRACTICAL</b> |                       |
| <b>Course Code</b>     | <b>: 22UPHAMQC/22UCHAMQC</b>            | <b>Hours / Week:2</b> |
| <b>Semester</b>        | <b>: IV</b>                             | <b>Credits:2</b>      |

**Course Objectives:**

1. To work with interpolation and approximation methods in finding roots using SageMath.
2. To utilize SageMath to perform symbolic and numerical integration. and Laplace Transforms

**SYLLABUS**

**Unit I: Theory of Equations**

Problems on Finding the roots of the equations using the SageMath

**(Page No: 139-140)**

**Unit II: Non-Linear Equations**

Numerical Solution: Location of solutions of Algebraic equations and Iterative Approximation Methods using SageMath

**(Page No: 263-278)**

**Unit III: Multiple integral**

Available Integration Functions, Multiple Integrals using SageMath

**(Page No: 305-317)**

**Unit IV: Laplace Equations**

Solving problems on Laplace transforms using SageMath

**(Page No: 225)**

**Unit V: Inverse Laplace Transforms**

Solving problems on Inverse Laplace transformations using SageMath

**(Page No: 226)**

**Book for Study:**

Computational Mathematics with SageMath

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | learn and understand the methods of double integrals.                            | <b>K-1</b>             |
| <b>2.</b>        | learn and understand the methods of triple integrals.                            | <b>K-2,K-3</b>         |
| <b>3.</b>        | apply the concept of integration to evaluate Fourier series.                     | <b>K-4</b>             |
| <b>4.</b>        | evaluate the solutions of differential equations using Laplace transform         | <b>K-4</b>             |
| <b>5.</b>        | evaluate the solutions of differential equations using inverse Laplace transform | <b>K-3</b>             |

**K1-Recall ; K2-Understand; K3-Apply; K4-Analyse; k5-Evaluate; K6-Create.**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |                           |                     |
|------------------------|---------------------------|---------------------|
| <b>Programme Title</b> | <b>:B.Sc. MATHEMATICS</b> |                     |
| <b>Course Title</b>    | <b>:REAL ANALYSIS – I</b> |                     |
| <b>Course code</b>     | <b>:22UMAC8</b>           | <b>Hours/Week:6</b> |
| <b>Semester</b>        | <b>:V</b>                 | <b>Credits:4</b>    |

**Course Objectives:**

1. To introduce the fundamental material on sequences and series to the students who have studied elementary calculus.
2. To make them study about metric spaces.

**SYLLABUS**

**Unit –I(Hours : 18)**

Operations on sets – family of sets – indexing set – functions – axioms of choice – relations – equivalence relation – partial order – total order – maximal element – finite set – countable set – uncountable set – contours numbers- Real valued functions - Equivalence sets - Real numbers – greatest lower bound and least upper bound of a sets - Sequence and subsequence - Limit of a sequence

**Unit –II(Hours : 18)**

**Sequence of Real Numbers:**

Convergent sequences - Divergent sequences - Bounded sequences - Monotone sequences - Operations on convergent sequences - Operations on divergent sequences.

Chapter 2 (Sections 2.3 to 2.8)

**Unit –III(Hours : 18)**

Limit superior and Limit Inferior - Cauchy sequences.

**Series of Real Numbers:**

Convergence and divergence - Series with non-negative terms - Alternating series.

Chapter 2 (Sections 2.9 & 2.10)

Chapter 3 (Sections 3.1 to 3.3)

**Unit – IV(Hours : 18)**

Conditional convergence and absolute convergence - Tests for absolute convergence - Series whose terms form a non increasing sequence - The class  $l^2$ .

Chapter 3 (Sections 3.4, 3.6, 3.7, 3.10)

**Unit –V(Hours : 18)**

**Limits and Metric Spaces**

Limit of a function on the real line - Metric spaces - Limits in metric spaces.

**Continuous functions on metric spaces:**

Functions continuous at a point on the real line - Reformulation - Functions continuous on a metric space.

Chapter 4 (Sections 4.1 to 4.3)

Chapter 5(Sections 5.1 to 5.3)

**Books for study :**

1. <https://nptel.ac.in/courses/111/106/111106053/>(For Unit I)
2. Richard R.Gold Berg, Methods of Real Analysis, Oxford & IBH. Publications CO.PVT.LTD.New Delhi.(For Unit II to V)

**Books for Reference:**

1. M.K. Singhal and Asha Rani Singhal, A First Course in Real Analysis, R. Chand & Co., June 1997 Edition
2. Shanthi Narayan, A Course of Mathematical Analysis, S. Chand & Co., 1995.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | recall the notions of operations on sets, functions, relations and learn to define bounded sets, countable sets, cauchy sequence of real numbers, infinite series and metric spaces. | K-1             |
| 2.        | understand the concepts of real numbers, lub and glb of sequences, absolute convergence of infinite series and continuous functions  | K-2             |
| 3.        | calculate the limit, limit superior and limit inferior of different types of sequences   | K-3             |
| 4.        | apply various tests for convergence and absolute convergence of an infinite series and solve problems on metric spaces   | K-3             |
| 5.        | analyse the properties of continuous functions and countable sets, Minkowski's theorem, the Schwarz inequality and Nested Interval theorem   | K-4, K-5        |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mapping of COs with POs:**

| PO<br>CO | PO   |      |      |      |      |      |      |      |      |
|----------|------|------|------|------|------|------|------|------|------|
|          | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
| CO1      | S    | M    | S    | L    | -    | S    | S    | S    | S    |
| CO2      | S    | M    | S    | L    | -    | S    | S    | S    | S    |
| CO3      | S    | M    | S    | L    | -    | S    | S    | S    | S    |
| CO4      | S    | M    | S    | L    | -    | S    | S    | S    | S    |
| CO5      | S    | M    | S    | L    | -    | S    | S    | S    | S    |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |                             |                     |
|------------------------|-----------------------------|---------------------|
| <b>Programme Title</b> | <b>: B.Sc. MATHEMATICS</b>  |                     |
| <b>Course Title</b>    | <b>: COMPLEX ANALYSIS I</b> |                     |
| <b>Course code</b>     | <b>: 22UMAC9</b>            | <b>Hours/Week:5</b> |
| <b>Semester</b>        | <b>: V</b>                  | <b>Credits:4</b>    |

**Course Objectives**

1. To acquire the knowledge of limit, continuity, differentiability, analyticity of functions of complex variable, contour integrals, transformations, conformal mappings etc.
2. To understand the theorems in the contents and their applications to solve problems.
3. To analyse the different type of transformations and contour integrals.

**SYLLABUS**

**Unit – I (Hours : 15)**

Regions in the complex plane - Functions of a complex variable - Mappings - Mappings by the Exponential function - Limits - Theorems on Limits - Continuity - Derivatives - Differentiation Formulas - Cauchy Riemann Equations - Sufficient conditions for Differentiability - polar coordinates - Analytic Functions - Harmonic Functions.  
Conformal mapping : Application to steady temperature  
Chapter 1 (section 11 only)  
Chapter 2 (sections 12 - 16, 18 - 26)

**Unit – II (Hours : 15)**

Derivatives of functions  $w(t)$  - Definite integrals of functions  $w(t)$  - contours - contour Integrals - Some Examples - Examples with branch cuts - upper bounds for moduli of contour integrals - Antiderivatives - Proof of the theorem - Cauchy - Goursat - Theorem - Proof of the theorem - Simply and Multiply connected Domains.  
Conformal mapping: Electro static potential  
Chapter 4 (sections 37 to 49)

**Unit – III (Hours : 15)**

Cauchy Integral Formula - An Extension of the Cauchy integral formula - Some consequences of the extension - Liouville's Theorem and the Fundamental Theorem of Algebra - Maximum modulus Principle.  
Conformal mapping: Two dimensional fluid flow  
Chapter 4 (sections 50 to 54)

**Unit – IV (Hours : 15)**

Mappings - Mappings by the Exponential function - Linear Transformations - The transformation  $w = 1/z$  - Linear Fractional Transformations - An implicit form.  
Conformal mapping: Stream function  
Chapter 2 (sections 13, 14)  
Chapter 8 (sections 90 to 94)

**Unit – V (Hours : 15)**

The Transformation  $w = \sin z$ ,  $w = \cos z$ ,  $w = \sinh z$ ,  $w = \cosh z$  - Mappings by  $z^2$  and branches of  $z^{1/2}$  - Conformal mappings - Preservation of Angles - Scale factors.  
Chapter 8 (sections 96, 97)  
Chapter 9 (sections 101, 102)



**Books for study:**

1. James Ward Brown and Ruel.V. Churchill - Complex variables and Applications Eighth Edition, Mc Graw Hill, Inc. (Units I toV)
2. <https://nptel.ac.in/courses/111/107/111107056/>(for Units I to IV Application)

**Books for Reference**

1. S.Arumugam,A.ThangapandiIsaacandA.Somasundaram-ComplexAnalysis,New Scitech Publications (India) Pvt Ltd,2002.
2. J. N. Sharma, Krishna Prakasan - Functions of Complex Variable – Thirteenth Edition Media(P) Ltd,1996-97.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | Learn the concepts of Functions of a complex variable, Mappings, Mappings by the Exponential function, limit, continuity, differentiability, analyticity of functions of complex variable, contour integrals, transformations and conformal Mappings                            | K-1             |
| 2.        | Understand the concepts of Cauchy - Riemann equations, derivatives of functions, Contour integration andCauchy's integralformula  | K-2             |
| 3.        | Apply the acquire knowledge of mappings, derivatives, contour integration, Cauchy integral formula, linear transformation, conformal mapping, <u>Electro static potential and solve the related problems</u>  | K-3             |
| 4.        | Analyze the properties of limits, derivations, continuity, analytic functions, harmonic functions ,anti derivatives, simply and doubly connected domain, Some consequences of theextension, <u>Applicationtosteadytemperature, Twodimensionalfluidflow and Stream function.</u> | K-4             |
| 5.        | Prove CR Equation, Sufficient conditions for Differentiability , Anti derivative theorem, Cauchy Goursat Theorem, Liouville's Theorem and Maximum modulus Principle   | K-5             |

**K1-Recall ; K2-Understand; K3-Apply; K4-Analyse; k5-Evaluate; K6-Create.**

**Mapping of COs with POs :**

| <b>CO</b>  | <b>PO</b>   |             |             |             |             |             |             |             |             |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
| <b>CO1</b> | S           | S           | S           | M           | S           | S           | S           | S           | S           |
| <b>CO2</b> | S           | S           | S           | M           | S           | S           | S           | S           | S           |
| <b>CO3</b> | S           | S           | S           | M           | S           | S           | S           | S           | S           |
| <b>CO4</b> | S           | S           | S           | M           | S           | S           | S           | S           | S           |
| <b>CO5</b> | S           | S           | S           | M           | S           | S           | S           | S           | S           |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title :B.Sc. MATHEMATICS**

**Course Title : MODERN ALGEBRA**

**Course code : 22UMAC10**

**Hours/Week:6**

**Semester : V**

**Credits:4**

**Course Objectives**

1. To acquire knowledge about various groups.
2. To gain knowledge about rings and special classes of rings.

**SYLLABUS**

**Unit–I(Hours :18)**

**Group Theory**

Subgroups, Cyclic groups, Cosets and Lagrange's theorem, Normal subgroups and Quotient groups.

Chapter 2 (Sections 2.4 - 2.7)

**Unit–II(Hours :18)**

**Group Theory**

Homomorphisms, Isomorphism theorems, Automorphisms, Permutation groups.

Chapter 2 (Sections 2.8 - 2.11)

**Unit–III(Hours :18)**

**Ring Theory**

Definition and examples, Properties, Special classes of rings, Subrings and subfields, Ideals and quotient rings, Homomorphisms.

Chapter 3 (Sections 3.1 - 3.6)

**Unit–IV(Hours :18)**

**Ring Theory**

Maximal and prime ideals, The characteristic of an integral domain, The field of quotients of an integral domain. Euclidean rings - Definition and properties, Unique factorization theorem, Gaussian integers.

Chapters 3 & 4 (Sections 3.7 - 3.9, 4.1 - 4.3)

**Unit–V(Hours :18)**

**Polynomial Rings**

Polynomials over fields, Polynomials over the rational field, Polynomials over commutative rings.

Chapter 5 (Sections 5.1 - 5.3)

**Book for study:**

M.L. Santiago, Modern Algebra, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

**Books for Reference :**

1. I. N. Herstein Topics in Algebra - Second Edition, Wiley India Pvt. Ltd, New Delhi, 2008.
2. S. Arumugam, A. Thangapandi Isaac - Modern Algebra, New Gamma Publication House, Palayamkotti, 1997.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | recognize the concepts of various types of groups, subgroups, rings and fields   | <b>K-1</b>             |
| <b>2.</b>        | understand the notions of structure preserving maps between groups and rings and inspect their applications            | <b>K-2, K-4</b>        |
| <b>3.</b>        | explain the attributes of different sorts of groups, ideals and defend their applications                              | <b>K-2, K-5</b>        |
| <b>4.</b>        | interpret the concepts of integral domains, unique factorization domains, polynomial rings and assess their attributes | <b>K-2, K-5</b>        |
| <b>5.</b>        | analyse the properties of various subgroups, rings and solve related problems  | <b>K-3, K-4</b>        |

**K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create**

**Mapping of COs with POs :**

| <b>CO \ PO</b> | <b>PO</b>   |             |             |             |             |            |             |             |             |
|----------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|
|                | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
| <b>CO1</b>     | S           | S           | S           | S           | M           | S          | S           | S           | S           |
| <b>CO2</b>     | S           | S           | S           | S           | M           | S          | S           | S           | S           |
| <b>CO3</b>     | S           | S           | S           | S           | M           | S          | S           | S           | S           |
| <b>CO4</b>     | S           | S           | S           | S           | M           | S          | S           | S           | S           |
| <b>CO5</b>     | S           | S           | S           | S           | M           | S          | S           | S           | S           |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |                           |                     |
|------------------------|---------------------------|---------------------|
| <b>Programme Title</b> | <b>:B.Sc. MATHEMATICS</b> |                     |
| <b>Course Title</b>    | <b>:MECHANICS</b>         |                     |
| <b>Course code</b>     | <b>:22UMAC11</b>          | <b>Hours/Week:5</b> |
| <b>Semester</b>        | <b>:V</b>                 | <b>Credits:5</b>    |

**SYLLABUS**

**UNIT I(Hours: 16)**

Equilibrium of a system of particles, Moment of a set of concurrent forces, Parallel forces, Couples, Equivalence of couples, Varignon's theorem, Reduction of any coplanar system of forces, Reduction of a coplanar system of forces - Analytical method.

Chapter II (Sections 2.1 - 2.11)

**UNIT II(Hours: 14)**

Friction (Definition) - Laws of Statical friction, Angle of friction, Cone of friction, Law of kinetic friction.

Chapter III (Sections 3.1 - 3.8)

**Unit – III( Hours : 15)**

Velocity and acceleration of a particle moving on a curve, velocity and acceleration components in cartesian coordinates, Velocity and acceleration components in polar coordinates(Plane motion)

Simple harmonic motion - Composition of two simple harmonic motions of the same period in the same straight line, Composition of two simple harmonic motions of the same period along two perpendicular lines, Simple Harmonic Motion as the projection of uniform circular motion, Oscillatory motion of particles connected to ends of elastic strings, The simple pendulum. The seconds pendulum.

Chapter 1(Section 1.10 only) and Chapter 4

**UNIT- IV(Hours : 15)**

Projectiles - The path of a projectile is a parabola, To trace the parabola, Maximum height reached, Time of flight, Horizontal range, Focus of the parabola, Directrix of the parabola, Velocity at any time 't' of the path, Maximum range on the horizontal plane, Range on an inclined plane through the point of projection, Maximum range on an inclined plane, Motion on an inclined plane.

Chapter 5 (Sections 5.4 - 5.4.1 - 5.4.9, 5.5 - 5.5.1 , 5.5.2 and 5.6)

**Unit –V(Hours : 15)**

Central force - Central orbit, The central orbit is a plane curve, Areal velocity about the centre of force is constant, Differential equation to a central orbit, p-r equation of the central orbit, Apse, Given the orbit, to find the law of force, Given the law of force, to find the orbit.

Chapter 6 (Section 6.6 - 6.9)

**Books for study:**

1. A. V. Dharmapadam, Statics, S. Viswanathan publications, Reprint 2011( For Unit I & II)
2. A.V. Dharmapadam, Dynamics, Viswanathan (Printers & Publishers) Pvt. Limited, 2006. (for Unit III , IV & V)

**Books for Reference:**

1. M.L. Khanna, Statics, Jai Prakash Nath & Co., Meerut.
2. Dr. M. K. Venkataraman, A Text Book of Statics, Agasthiar Book Depot.

3. Dr. M.K. Venkataraman, Dynamics, Agasthiyar Publications, Thirteenth Edition, July 2009.
4. P. Duraipandian, LaxmiDuraipandian and MuthamizhJayapragasam, Mechanics, S. Chand and company Pvt Ltd, 2014.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | learn the principles of Statics and Dynamics and to develop the ability to describe the concepts.   | K-1             |
| 2.        | understand necessary conditions for the equilibrium of particles acted upon by various forces and laws of statical friction                           | K-2             |
| 3.        | explain the concepts of velocity and acceleration of a particle moving on a curve, simple harmonic motion, Projectiles and Central forces             | K-2             |
| 4.        | apply moment, couples, Second's pendulum, friction, motion on an inclined plane and p-r equation of the central orbit to various real life situations | K-3             |
| 5.        | gain ability to solve and analyse problems of Statics and dynamics in asystematic and logical manner.   | K-3, K-4        |

**K-1 Recall; K-2 Understand; K-3 Apply; K-4 Analyse; K-5 Evaluate; K-6 Create**  
**Mapping of COs with POs :**

| CO \ PO | PO  |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|         | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| CO1     | S   | M   | S   | S   | -   | S   | S   | S   | S   |
| CO2     | S   | M   | S   | S   | -   | S   | S   | S   | S   |
| CO3     | S   | M   | S   | S   | -   | S   | S   | S   | S   |
| CO4     | S   | M   | S   | S   | -   | S   | S   | S   | S   |
| CO5     | S   | M   | S   | S   | -   | S   | S   | S   | S   |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

For candidates admitted from 2022 -2023 onwards

**Programme Title : B.Sc. MATHEMATICS**

**Course Title : BIOMATHEMATICS**

**Course Code : 22UMAEC2**

**Hours /Week:3**

**Semester :V**

**Credits: 3**

**Course Objectives**

1. To understand the concept of modeling using MATLAB/Scilab.
2. To develop the ability of solving the homogenous and non-homogenous system of difference

**SYLLABUS**

**Unit- I(Hours: 10)**

**Overview of Discrete Dynamical Modeling and MATLAB/Scilab**

Introduction to Modeling and Difference Equations - The Modeling Process - Getting Started with MATLAB/Scilab.

(Chapter 1)

Nernst equation (Chapter 9)

**Unit- II(Hours: 09)**

**Modeling with first-order Difference Equations**

Modeling with First-Order Linear Homogenous Difference with Constant Coefficients -

Modeling with Non-homogenous First-Order Linear Difference Equations (Chapter 2)

Diffusion-I: Diffusion equation (Chapter 9)

**Unit -III(Hours: 07)**

**Modeling with Matrices**

Systems of Linear Equations Having Unique Solutions - The Gauss-Jordan Elimination Method With

Models - Introduction to Matrices

(Chapter 3: 3.3.10 – 3.3.17)

Diffusion-II: Mean-square Displacement (Chapter 9)

**Unit IV(Hours: 09)**

**Modeling with Matrices**

Determinants and System of Linear Equations (Chapter 3: 3.4.1 & 3.4.2) Computing

Eigenvalues and Eigenvectors with MATLAB/Scilab (Chapter 3: 3.5.3 – 3.5.6)

Diffusion-III: Einstein's relation (Chapter 9)

**Unit V(Hours: 10)**

**Modeling with Nonlinear Systems of Difference Equations**

Modeling of Interacting Species (Chapter 5: 5.1.1 & 5.1.2)

**Books for study**

- 1 Mazen Shahin,  
Explorations of Mathematical Models in Biology with MATLAB, Wiley Publishers. (for Unit I to Unit V)
- 2 Introduction to Mathematics for Life Scientists, E. Batschelet, Springer Verlag, 3rd edition (2003). (for Unit I to IV)

**Books for References:**

- 1 R Phillips, J Kondev, J. Theriot, Physical Biology of the Cell, Garland Science 2009
- 2 H.C. Berg, Random Walks in Biology, Princeton University Press, 1993
- 3 <https://nptel.ac.in/courses/102/101/102101003/>

**Course Outcomes (CO): On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>CO1</b>       | Learn the modeling process of first order homogenous and non-homogenous difference equations with equilibrium values and understand the basics of MATLAB | <b>K1 &amp; K2</b>     |
| <b>CO2</b>       | Apply the process of Modeling using difference equations and diffusion equations   | <b>K3</b>              |
| <b>CO3</b>       | Examine the role of Gauss-Jordan Elimination method and Einstein's relation in solving difference equations  | <b>K4</b>              |
| <b>CO4</b>       | Explain the recursions occurring in a difference equation through matrices, and compute the Eigenvalues and Eigenvectors through MATLAB.                 | <b>K5</b>              |
| <b>CO5</b>       | Formulate Model for real situations using the system of linear equations in matrices and utilize MATLAB for finding solutions for the same.              | <b>K6</b>              |

**K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create**





**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title :BIOMATHEMATICS-PRACTICAL**

**Course Code :22UMAEQC**

**Hours / Week: 2**

**Semester : V**

**Credit: 1**

**Course Objectives:**

1. To use MATLAB/Scilab for solving problems on difference equations
2. To compute and solve problems on matrices using MATLAB/Scilab

**UNIT-I:**

Getting Started with MATLAB/Scilab - Operations on Vectors and Matrices

**UNIT-II:**

Problems on Modeling with First - Order Linear Homogenous and Non- Homogenous Difference equations with Constant Coefficients for computing amount of drug present in blood after a few hours, Owl's population, in the process of Radioactive Decay and Carbon Dating and Forensic Application.

**UNIT-III:**

Problems solving using Gauss-Jordan Elimination Method for Biologists mixer problem, Nutrition Problems, Existence of bacteria, Balancing Chemical Equations

**UNIT-IV:**

Computing Eigenvalues and Eigenvectors with MATLAB/Scilab for Population movement problems

**UNIT-V:**

Problems on non-linear systems viz Predator-Prey Model using MATLAB/Scilab tools.

**Book for study**

Mazen Shahin, Explorations of Mathematical Models in Biology with MATLAB, Wiley Publishers(2014).

**Books for References:**

- 1 R Phillips, J Kondev, J. Theriot, Physical Biology of the Cell, Garland Science, 2009
- 2 H. C. Berg, Random Walks in Biology, Princeton University press, 1993

**Web Resource:**

<https://www.mathworks.com/solutions/mathematical-modeling.html>

**Course Outcomes (CO):** On completion of the course, students would be able to

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>1.</b>        | recall the basics of MATLAB/Scilab  | <b>K 1</b>             |
| <b>2.</b>        | express the difference equations as matrices and solve them using MATLAB/Scilab   | <b>K 2</b>             |
| <b>3.</b>        | apply MATLAB/Scilab to analyse the society connected problems   | <b>K 3 &amp; K 4</b>   |
| <b>4.</b>        | perceive the idea of recurrences in difference equations and compute the Eigenvalues and Eigenvectors using MATLAB/Scilab | <b>K 5</b>             |
| <b>5.</b>        | estimate the solution for problems occurring in real life by using MATLAB/Scilab  | <b>K 6</b>             |

**K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6 Create**

**Mapping of COs with POs:**

| <b>CO \ PO</b> | <b>PO</b>  |            |            |            |            |            |            |            |            |
|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> |
| <b>CO1</b>     | S          | L          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO2</b>     | S          | S          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO3</b>     | S          | S          | S          | S          | S          | S          | S          | S          | S          |
| <b>CO4</b>     | S          | M          | M          | S          | S          | S          | S          | S          | S          |
| <b>CO5</b>     | S          | S          | S          | S          | S          | S          | S          | S          | S          |

**S – Strong, M – Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title : DATA STRUCTURES**

**Course Code : 22UMAESC2**

**Hours / Week: 5**

**Semester: V**

**Credits : 4**

**Course Objectives: The course aims to**

1. understand the concepts of built in data structures, Linked lists and sorting algorithm.
2. gain knowledge about operations on queues, get node and free node and pointer variables.
3. know about operations on stacks recursion and creating index.

**SYLLABUS**

**Unit - I (Hours: 15)**

Built in data structures - One and two dimensional arrays - Packed structures - Stacks - Operations on stacks - Implementation - Queue - Operations on Queues - Implementation - Another queue design - Application - Expression Evaluation, Simulation, Playing maze.

**Unit - II (Hours: 15)**

Linked lists - Operations - Get node and Free node - Implementation as an array of records - Implementing list operations - Inserting in an ordered list - Deleting from ordered list - Implementation - Stacks and queues as linked lists - Circular linked lists - Application - Magazine circulation.

**Unit - III (Hours: 15)**

Pointer variables - Up arrow syntax - Debugging hints - Recursion - Function sum - Reverse print - NFACT - Application - Quick Sort - Dynamic Storage Allocation.

**Unit - IV (Hours: 15)**

Binary Search trees - Searching - Insertion - Deletion - Implementations - Traversals - Binary expression trees - A non-linked representation - Heap sort - Application - Creating Index.

**Unit - V (Hours: 15)**

Sorting Algorithm - Analysing Quick Sort - Analyzing heap sort - Sequential searching - Binary Search - Hashing.

**Book for study**

1. Nell Dala and Susan C.Lilly, Pascal Plus Data Structures Algorithms and Advanced Programming, Tata McGraw Hill Pvt. Company Ltd., 16<sup>th</sup> edition 2001, New Delhi.
2. RadhaGanesan, "C and Data Structures" - Scitech Publications Chennai 2<sup>nd</sup> edition 2002.
3. Ellis Horowitz, "Fundamentals of Data Structures", SartajSahaniGalgotia Publishers, 1983, New Delhi.
4. Seymour Lipschutz, "Theory and Problems of Data Structures" Schaum's series, Tata McGraw Hill Pvt. Company.

**Books for Reference:**

Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures & Algorithms, 1e by , Pearson Education India publishers, 1<sup>st</sup> edition -2002.

**Web Resource :**

<http://www.cs.yale.edu/homes/aspnes/classes/223/notes.pdf>

**Note:** Questions to be taken only from the text book

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | recall the basic concepts of data structures, one and two dimensional arrays, packed structures, stacks and operations on queues | K-1             |
| 2.        | understand the concept of stacks and queues as linked list operations  | K-2             |
| 3.        | illustrate pointer variables, up arrow syntax, debugging, recursion, function sum, reverse print, N-FACT with examples           | K-2             |
| 4.        | analyse the basic properties of binary search trees, binary expression trees, creating index, traversals and its applications    | K-4             |
| 5.        | relate data structure to the real-world problems   | K-1             |

**K-1 Recall, K-2 Understand, K-3 Apply, K-4 Analyse, K-5 Evaluate, K-6 Create**

**Mapping of COs with POs:**

| PO<br>CO | PO   |     |      |      |      |      |      |     |      |
|----------|------|-----|------|------|------|------|------|-----|------|
|          | PO 1 | PO2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO8 | PO 9 |
| CO1      | S    | M   | S    | S    | S    | S    | S    | S   | S    |
| CO2      | S    | M   | S    | S    | S    | S    | S    | S   | S    |
| CO3      | S    | M   | S    | S    | S    | S    | S    | S   | S    |
| CO4      | S    | M   | S    | S    | S    | S    | S    | S   | S    |
| CO5      | S    | M   | S    | S    | S    | S    | S    | S   | S    |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.A/B.Sc/B.Com**

**Course Title : NON MAJOR SKILL BASED I - INDUSTRIAL MATHEMATICS  
WITH R PROGRAMMING - PRACTICAL**

**Course Code :22UMAQNSC1**

**Hours / Week: 2**

**Semester :V**

**Credits: 2**

**Course Objectives**

To inculcate the basics of Matrices, Linear Programming and Assignment Problems through R Programming Software

**Unit I**

Linear Equations – Matrix Inversion & Linear Equations Solution.

**Unit II**

Linear programming Problems.

**Unit III**

Transportation Model

- North West Corner Method
- Least Cost Method

**Unit IV**

Transportation Model

- Vogel's Approximation Method

**Unit V**

Assignment Problems.

**Books for study:**

1. Prof. V. Sundaresan, Prof. K. S. Ganapathy Subramanian and Prof. K. Ganesan, Resource Management Techniques (Operations Research), AR Publications, Chennai.
2. Roger D. Peng, R Programming for Data Science.

**Web Resource:**

1. <https://analyticsindiamag.com/introduction-to-basic-concepts-of-r-programming-language/>

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>CO 1</b>      | Find the solutions of Assignment problems with R Studio.   | K-1                    |
| <b>CO 2</b>      | Understand the basic matrix operations and solve the same with the aid of R studio                 | K-2                    |
| <b>CO 3</b>      | Interpret and solve Linear Programming Problems and Dual Linear Programming Problem using R Studio | K-2 & K-3              |
| <b>CO 4</b>      | Solve problems using North West Corner Method and Least Cost Method faster with R studio           | K-3                    |
| <b>CO 5</b>      | Solve Problems using Vogel's Approximation Method more quickly with the aid of R studio            | K-3                    |

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                        |                            |                     |
|------------------------|----------------------------|---------------------|
| <b>Programme Title</b> | <b>:B.Sc. MATHEMATICS</b>  |                     |
| <b>Course Title</b>    | <b>:REAL ANALYSIS – II</b> |                     |
| <b>Course code</b>     | <b>:22UMAC12</b>           | <b>Hours/Week:6</b> |
| <b>Semester</b>        | <b>:VI</b>                 | <b>Credits:4</b>    |

**Course Objectives:**

1. To gain knowledge about connected sets, compact metric spaces, totally bounded sets and complete metric spaces.
2. To discuss the concepts of the Riemann integral, existence of Riemann integral and properties of Riemann integral.
3. To understand the concepts of derivatives and fundamental theorem of calculus.
4. To develop the ability to reflect critically on the methods they have chosen to solve problems.

**SYLLABUS**

**Unit –I(Hours : 14)**

Continuous functions on metric spaces:

Open sets - Closed sets - Discontinuous functions on  $\mathbb{R}^1$ .

Chapter 5(Sections 5.4 to 5.6)

**Unit –II(Hours : 15)**

Connectedness, Completeness and Compactness: More about open sets - Connected sets - Bounded set and totally bounded sets - Complete metric spaces.

Chapter 6(Sections 6.1 to 6.4)

**Unit –III(Hours : 15)**

Compact metric spaces - Continuous functions on compact metric spaces- Continuity of the inverse function - Uniform continuity.

Chapter 6(Sections 6.5 to 6.8)

**Unit –IV(Hours : 15)**

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)

**Unit –V(Hours : 16)**

Derivatives - Rolle's theorem - The law of the mean - Fundamental theorem of calculus. L'Hospital's rule - Taylor's theorem - Taylor's series– Maclaurin series – Improper integral..

**Books for study:**

1. Richard R.Gold Berg, Methods of Real Analysis, Oxford & IBH. PublicationsCO.PVT.LTD.NewDelhi. (For Unit I to Unit IV)
2. For Unit V: <https://nptel.ac.in/courses/111/106/111106053/>

**Books for Reference:**

1. M.K. Singhal and Asha Rani Singhal, A First Course in Real Analysis, R. Chand & Co., June1997 Edition
2. Shanthi Narayan, A Course of Mathematical Analysis, S. Chand & Co., 1995.



**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | learn the concepts of open sets, closed sets, Connected sets, Taylor's series and Compact metric space                       | <b>K-1</b>             |
| <b>2.</b>        | understand several standard concepts of metric spaces  | <b>K- 2</b>            |
| <b>3.</b>        | analyse totally bounded sets, discontinuous functions at a point, Rolle's theorem, mean value theorem and their applications | <b>K-4</b>             |
| <b>4.</b>        | prove the properties of Riemann integral, complete and compact metric spaces and apply them to solve the related problems    | <b>K-3, K-5</b>        |
| <b>5.</b>        | examine Law of mean and fundamental theorem of calculus  | <b>K-4</b>             |

**K-1 :Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6 :Create.**

**Mapping of COs with POs:**

| <b>PO<br/>CO</b> | <b>PO</b>   |             |             |             |             |             |             |             |             |
|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
| <b>CO1</b>       | S           | M           | S           | L           | -           | S           | S           | S           | S           |
| <b>CO2</b>       | S           | M           | S           | L           | -           | S           | S           | S           | S           |
| <b>CO3</b>       | S           | M           | S           | L           | -           | S           | S           | S           | S           |
| <b>CO4</b>       | S           | M           | S           | L           | -           | S           | S           | S           | S           |
| <b>CO5</b>       | S           | M           | S           | L           | -           | S           | S           | S           | S           |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title :B.Sc. MATHEMATICS**  
**Course Title : COMPLEX ANALYSIS – II**  
**Course code :22UMAC13** **Hours/Week:5**  
**Semester :VI** **Credits:4**

**Course Objectives**

1. To acquire knowledge in series, functions, Residues and intergrals.
2. To understand the theorems on convergence of series, methods of finding residues at singular points of a function etc.
3. To analyze the different methods of evaluation of integrals.

**SYLLABUS**

**Unit – I(Hours : 15)**

Convergence of Sequences and series - Taylor Series - Proof of Taylor's theorem Examples - Laurent Series - Proof of Laurent's theorem - Examples.

Chapter 5 (Sections 55 - 62)

**Unit – II(Hours : 15)**

Absolute and Uniform Convergence of Power Series - Continuity of sums of Power series - Integration and Differentiation of Power Series - Uniqueness of series Representations - Multiplication and Division of Power Series.

Chapter 5 (Sections 63 - 67)

**Unit – III(Hours : 15)**

Isolated Singular Points - Residues - Cauchy's Residue Theorem - Residue at infinity - The Three types of Isolated Singular Points - Residues at Poles - Zeros of analytic functions - Zeros and Poles - Behavior of functions near isolated singular points.

Chapter 6 (Sections 68 - 77)

**Unit – IV(Hours : 15)**

Evaluation of Improper Integrals - Examples - Improper Integrals from fourier analysis - Jordan's Lemma- Indented Paths - An indentation around a branch point.

Chapter 7 (Sections 78 - 83)

**Unit – V(Hours : 15)**

The Argument (Counting) Principle - Rouche's Theorem and the Fundamental theorem of Algebra- Winding number- Branch of Complex Algorithm.

**Books for study :**

1. James Ward Brown and Ruel V.Churchill - Complex variables and Applications,Eighth Edition, Mc.Graw - Hill, Inc. (For Unit I to IV)
2. <https://nptel.ac.in/courses/111/106/111106141/>(For Unit V)
3. <https://nptel.ac.in/courses/111/106/111106084/> (For Unit V)

**Books for Reference :**

1. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Complex Analysis, New Scitech Publications (India) Pvt Ltd, 2002.
2. J. N. Sharma, Functions of Complex Variable, Thirteenth Edition, Krishna Prakasan Media(P) Ltd, 1996-97.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | learn the significance of convergence and uniformly convergence of power series.   | K-1             |
| 2.        | apply the concepts of Taylor and Laurent series expansions of analytic functions, Residues and argument principle to solve the related problems                              | K-3             |
| 3.        | expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals. | K-4             |
| 4.        | use the properties of three types of Isolated Singular Points, Improper Integrals from fourier analysis and analyze the problems related to that functions                   | K-3, K-4        |
| 5.        | understand the idea of indented paths and integrals and apply on argument principle and Rouche's theorem.  | K-2, K-3        |

**K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create**

**Mapping of COs with POs:**

| CO \ PO | PO   |      |      |      |      |      |      |      |      |
|---------|------|------|------|------|------|------|------|------|------|
|         | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
| CO1     | S    | M    | S    | S    | -    | S    | S    | S    | S    |
| CO2     | S    | M    | S    | S    | -    | S    | S    | S    | S    |
| CO3     | S    | M    | S    | S    | -    | S    | S    | S    | S    |
| CO4     | S    | M    | S    | S    | -    | S    | S    | S    | S    |
| CO5     | S    | M    | S    | S    | -    | S    | S    | S    | S    |

**S- Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

|                           |                           |                     |
|---------------------------|---------------------------|---------------------|
| <b>Programme Title</b>    | <b>:B.Sc. MATHEMATICS</b> |                     |
| <b>Course Title</b>       | <b>:LINEAR ALGEBRA</b>    |                     |
| <b>Course code</b>        | <b>:22UMAC14</b>          | <b>Hours/Week:6</b> |
| <b>Semester</b>           | <b>:VI</b>                | <b>Credits:4</b>    |
| <b>Course Objectives:</b> |                           |                     |

1. To gain knowledge about the third algebraic system, the vector space.
2. To include knowledge about the linear transformation on vector space.
3. To determine the existence and nature of solution of systems of linear equations.
4. To acquire knowledge about the normal and self adjoint operators.

**SYLLABUS**

**Unit –I(Hours : 18)**

**Vector Spaces and Inner Product Spaces**

Definition and Simple properties – Subspaces and Quotient Spaces-Sums and Direct sums – Linear independence – Basis and dimensions.

Chapter 6(Sections : 6.1- 6.5)

**Unit- II(Hours : 18)**

**Vector Spaces and Inner Product Spaces**

Homomorphisms – Dual spaces – Inner product spaces.

Chapter 6(Sections : 6.6 - 6.8)

**Unit –III(Hours : 18)**

**Linear Transformations and Matrices**

The Algebra of linear transformations – Eigen values and Eigen vectors -Matrix algebra.

Chapter 7 (Sections : 7.1 - 7.3)

**Unit – IV(Hours : 18)**

**Linear Transformations and Matrices**

Triangular forms - Adjoints – Normal and self- adjoint operators – Spectral theorem for normal and self-adjoint operators

**Unit –V(Hours : 18)**

**Linear Transformations and Matrices**

Linear equations – Determinants.

Chapter 7 (Sections :7.7, 7.8)

**Books for study :**

1. M.L. Santiago, Modern Algebra, Tata Mcgraw – Hill Publishing Company Ltd., New Delhi.(For Unit I to IV)
2. <https://nptel.ac.in/courses/111/106/111106135/>(For Unit IV)

**Books for Reference :**

1. I. N. Herstein, Topics in Algebra Second Edition, Wiley India Pvt. Ltd, New Delhi, 2008.
2. S. Arumugam, A. ThangapandiIsaac, Modern Algebra, New Gamma Publication House, Palayamkotti, 1997.

**Course Outcomes (CO) : On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>1.</b>        | learn the concepts of vector spaces, matrices, linear equations and linear transformations   | <b>K-1</b>             |
| <b>2.</b>        | understand the notions of vector spaces and its forms, linear transformations and inspect their properties   | <b>K-2, K-4</b>        |
| <b>3.</b>        | assess the properties of matrix, eigen values and eigen vectors and triangular forms of linear transformations   | <b>K-5</b>             |
| <b>4.</b>        | apply various methods to find solutions of linear equations, determine inverse of a matrix using Cayley – Hamilton theorem                               | <b>K-3, K-5</b>        |
| <b>5.</b>        | interpret the notions of vector spaces, linear transformations, matrices and determinants, adjoint and self-adjoint operators and solve related problems | <b>K-2, K-3</b>        |

**K-1: Recall, K-2: Understand, K-3: Apply, K-4: Analyse, K-5: Evaluate, K-6: Create**

**Mapping of COs with POs:**

| <b>PO<br/>CO</b> | <b>PO</b>   |             |             |             |             |             |             |             |             |
|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
| <b>CO1</b>       | S           | S           | S           | S           | M           | S           | S           | S           | S           |
| <b>CO2</b>       | S           | S           | S           | S           | M           | S           | S           | S           | S           |
| <b>CO3</b>       | S           | S           | S           | S           | M           | S           | S           | S           | S           |
| <b>CO4</b>       | S           | S           | S           | S           | M           | S           | S           | S           | S           |
| <b>CO5</b>       | S           | S           | S           | S           | M           | S           | S           | S           | S           |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title : NUMERICAL METHODS**

**Course Code : 22UMAC15**

**Hours / Week: 5**

**Semester: VI**

**Credits : 4**

**Course Objectives:**

1. To solve algebraic and transcendental equations by various numerical methods.
2. To acquire knowledge on numerical differentiation and integration.
3. To know about the concepts of finite differences and interpolation.

**SYLLABUS**

**Unit-I (Hours: 15)**

**The Solution of Numerical Algebraic and Transcendental Equations**

The Bisection Method (or BOLZANO'S method or Interval halving method), Iteration method (or method of successive approximations), The conditions for the convergence of the method, Order of convergence of an iterative process, Regula Falsi method (or the method of false position), Geometrical interpretation, Newton – Raphson method (or Newton's method), Geometrical meaning of Newton's method, Criterion for the convergence in Newton – Raphson method & Order of convergence of Newton's method.

Chapter-3 (Sections : 3.1.1, 3.2, 3.2.1, 3.2.2, 3.3, 3.3.1, 3.4, 3.4.1, 3.4.2 & 3.4.3 (Page No: 69 – 98))

**Unit-II (Hours: 15)**

**Solutions of Simultaneous Linear Algebraic Equations**

Gauss – Elimination Method, Gauss – Jordan elimination Method (Direct method), Inversion of a matrix using Gauss – Elimination method, Iterative methods, Jacobi method of iteration or Gauss – Jacobi method & Gauss -Seidel method of iteration.

Chapter-4 (sections: 4.1, 4.2, 4.2.1, 4.3, 4.7, 4.8 & 4.9 (Page No: 112 – 132, 145 – 159))

**Unit- III (Hours: 15)**

**Finite Differences**

First difference, Express any value of  $y$  in term of  $y_n$  and the backward differences of  $y_n$ , Differences of a polynomial, Factorial polynomial, Error Propagation, Summation of Series & Montmort's theorem.

Chapter-5 (sections: 5.1, 5.2, 5.3, 5.4, 5.5, 5.7 & 5.8 (Page No: 170 – 207))

**Unit-IV (Hours: 15)**

**Interpolation**

Gregory – Newton forward interpolation formula or Newton's forward interpolation formula (*for equal intervals*), Gregory – Newton Backward Interpolation formula (*for equal intervals*) & Equidistance terms with one or more missing values.

**Central Difference Interpolation Formulae** (*for equal intervals*)

Gauss's forward interpolation formula, Gauss's backward interpolation formula, Bessel's formula.

**Interpolation with unequal intervals**

Divided differences, Newton's interpolation formula for unequal intervals, Lagrange's interpolation formula (for unequal intervals), Different form of Lagrange's interpolation formula & Inverse interpolation .

Chapter-6-sec: 6.2 & 6.3 - Page No: 210 – 225

Chapter-7 (Section: 7.3, 7.4 & 7.6 - Page No: 231 – 240, 242 )

Chapter-8 (Section: 8.2, 8.5, 8.7 & 8.8 - Page No: 257-260, 263 – 280)

### Unit-V(Hours:15)

#### Numerical Differentiation and Integration

Newton's forward difference formula to get the derivative, Newton's backward difference formula to compute the derivative, Derivative using Stirling's formula & To find maxima and minima of the function given the tabular values. A general quadrature formula for equidistant ordinates (or *Newton-cote's formula*), Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighths rule & Weddle's rule.

Chapter-9 (Section :9.2, 9.3, 9.4, 9.6, 9.8, 9.9, 9.13, 9.14 & 9.15 (Page No: 281 – 301, 303 – 306)

#### Book for Study

P.Kandasamy, K, Thilagavathy, K. Gunavathy, Numerical Methods, First edition, S.Chand & Company Ltd.

#### Book for Reference:

H.C. Saxena-Finite Differences and Numerical Analysis, S. Chand Publishers, 2005.

#### Course Outcomes (CO) : On completion of the course, students would be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| 1.        | learn the concepts of various topics in Numerical methods.   | K-1             |
| 2.        | understand various methods to obtain numerical solution of algebraic and transcendental equations, simultaneous linear algebraic equations, the concepts of finite differences, various formula on interpolation with equal intervals and unequal intervals, numerical differentiation and integration | K-2             |
| 3.        | apply the acquired knowledge to obtain numerical solution of algebraic and transcendental equations and simultaneous linear algebraic equations.   | K-3             |
| 4.        | use the interpolation techniques to compute and analyse the problems on Interpolation and apply the acquired knowledge to solve problems on finite differences.  | K-3, K-4        |
| 5.        | solve the problems/society connect problems using numerical method on differentiation and integration.   | K-3             |

**K-1: Recall; K-2 :Understand; K-3 :Apply; K-4 :Analyze; K-5 :Evaluate; K-6:Create.**

**Mappings of Cos with Pos:**

|                            |          |             |             |             |             |             |             |             |             |             |
|----------------------------|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| S<br>t<br>r<br>o<br>n<br>g | PO<br>CO | PO          |             |             |             |             |             |             |             |             |
|                            |          | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> |
|                            | CO1      | S           | M           | S           | S           | S           | S           | S           | S           | S           |
|                            | CO2      | S           | M           | S           | S           | S           | S           | S           | S           | S           |
|                            | CO3      | S           | M           | S           | S           | S           | S           | S           | S           | S           |
|                            | CO4      | S           | M           | S           | S           | S           | S           | S           | S           | S           |
| CO5                        | S        | M           | S           | S           | S           | S           | S           | S           | S           |             |

, M - Medium, L – Low



**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.Sc. MATHEMATICS**

**Course Title: GRAPH THEORY**

**Course Code: 22UMASEC3**

**Semester: VI**

**Hours / Week: 5**

**Credits: 4**

**Course Objectives:**

1. To Acquire the basic knowledge of various types of graphs.
2. To Know about the problem-solving power of the graph theory.
3. To Know about the applications of graphs to simple situations and puzzles.

**SYLLABUS**

**Unit – I (15 Hours)**

Graphs and Subgraphs Definition and examples, Degrees, Subgraphs, Operations on graphs

**Unit – II (15 Hours)**

Connectedness Walks, Trails and Paths, Connectedness and Components, Blocks, Connectivity.  
Chapter 4

**Unit – III ( 15 Hours)**

Eulerian And Hamiltonian Graphs Eulerian graphs, Hamiltonian graphs.

**Unit – IV (15 Hours)**

Trees Characterisation of trees, Centre of a tree.

**Unit – V (15 Hours)**

Directed Graphs Definition and basic properties, Paths and connections, Digraphs and Matrices.

**Book for Study:**

S. Arumugam, S. Ramachandran - Invitation to Graph Theory, Year of Publication 2001, Scitech Publications, Chennai.

**Books for Reference:**

1. Narsingh Deo -Graph Theory with applications to Engineering and Computer Science , Prentice Hall of India, 2004.
2. Gary Chartrand and Ping Zhang - Introduction to Graph Theory, Tata McGraw-Hill Edition, 2004

**Web Resources :**

1. <http://nptel.ac.in/courses/111106050>
2. <https://cs.bme.hu/fcs/graphtheory.pdf>

(Questions to be taken only from the text books)

**Course Outcomes (CO) : On completion of the course, students would be able to**

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| 1.        | understand the definition and basics of graphs with types and examples      | K-2             |
| 2.        | interpret the concepts of Connectedness in graph                            | K-2             |
| 3.        | apply Eulerian and Hamiltonian Graphs to solve related problems             | K-3             |
| 4.        | analyse the characterisation of trees and classification of directed graphs | K-4             |
| 5.        | relate the graph theory to the real world problems                          | K-1             |

**K-1 :Recall, K-2 :Understand, K-3 :Apply, K-4 :Analyse, K-5 :Evaluate, K-6 :Create**

**Mapping of COs with POs:**

| CO \ PO | PO   |      |      |      |      |      |      |      |      |
|---------|------|------|------|------|------|------|------|------|------|
|         | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 |
| CO1     | L    | L    | L    | L    | L    | L    | L    | L    | L    |
| CO2     | M    | M    | S    | S    | S    | M    | S    | L    | S    |
| CO3     | M    | S    | M    | S    | S    | M    | S    | L    | S    |
| CO4     | M    | S    | M    | S    | S    | M    | S    | L    | S    |
| CO5     | S    | S    | M    | S    | S    | S    | S    | L    | S    |

**S - Strong, M - Medium, L – Low**

**SRI SARADA COLLEGE FOR WOMEN (AUTONOMOUS), SALEM -16**

**For candidates admitted from 2022 -2023 onwards**

**Programme Title: B.A/B.Sc/B.Com**

**Course Title: NON MAJOR SKILL BASED II –MATHEMATICAL MODELING WITH R PROGRAMMING - PRACTICAL**

**Course Code: 22UMAQNSC2**

**Hours / Week: 2**

**Semester: VI**

**Credits: 2**

**Course Objectives**

To introduce the notions of data frames and big data through R programming software.

**SYLLABUS**

**Unit I**

Creating Vectors and Matrices

**Unit II**

Extraction of Vectors and Matrices

**Unit III**

Elementary operations on Vectors and Matrices

**Unit IV**

Big Data Analysis

**Unit V**

Control Structures

**Book for Study:**

David Loshin, Big data Analytics, MK Publications, USA.

**Web Resource:**

1. <https://r4ds.had.co.nz/model-basics.html>

**Course Outcomes (CO): On completion of the course, students would be able to**

| <b>CO Number</b> | <b>CO Statement</b>  | <b>Knowledge Level</b> |
|------------------|--|------------------------|
| <b>CO 1</b>      | Learn data frames and basics of Big Data using R Studio                              | K-1                    |
| <b>CO 2</b>      | Understand the difference between creating a vector and matrix in R studio           | K-2                    |
| <b>CO 3</b>      | Apply the basics of R studio to extract necessary elements from a vector and matrix  | K-3                    |
| <b>CO 4</b>      | Compute basic arithmetic operations on vectors and matrices with the aid of R studio | K-3                    |
| <b>CO 5</b>      | Build patterns and structures with the aid of R studio                               | K-3                    |