

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
(Accredited by NAAC “A<sup>++</sup>” Grade with 3.38 CGPA)  
**B.A./B.Sc. FIRST YEAR MATHEMATICS SYLLABUS**

**PAPER – I**

**SEMESTER –I**

Paper Code -- MAT109 :: **DIFFERENTIAL EQUATIONS**

(For the batch admitted in 2021-2022)

Total marks: 100

SEE: 50

CIA: 50

Lecture-5, Tutorial-1

Credits: 5

**UNIT-I: Differential Equations of first order and first degree: (12HRS)**

Exact differential equations; Integrating factors; Linear differential equations; Differential Equations reducible to linear form(Bernouli's Equations); Change of variables; Orthogonal Trajectories – Cartesian form & Polar form.

**[1]: Chapter 2** (Sections 2.1 to 2.15 & 2.20 to 2.25)

**Problem Solving Sessions:** Including all Exercise Problems

**UNIT- II: Differential Equations of first order but not of the first degree (12HRS)**

Equations solvable for p; Equations solvable for x; Equations solvable for y; Equations that do not contain x (or y); Equations of the first degree in x and y – Clairaut's equations.

**[1]Chapter 3** (Sections 3.1 to 3.8)

**Problem Solving Sessions:** Including all Exercise Problems

**UNIT –III: Higher Order linear Differential Equations –I(14HRS)**

Solution of Homogeneous linear differential equations of order n with constant coefficients, Solution of the non - homogeneous linear differential equations with constant coefficients by means of Polynomial operators.

**[1] Chapter 4** (Sections 4.1 to 4.33)

**Problem Solving Sessions:** Including all Exercise Problems

**UNIT –IV: Higher Order linear Differential Equations-II (12HRS)**

Method of Variation of parameters; Linear differential equations with non- constant coefficients; The Cauchy- Euler equation.

**[1] Chapter 5** (Sections 5.4 to 5.6)

**Problem Solving Sessions** Including all Exercise Problems

## **UNIT –V: System of linear Differential Equations.(10HRS)**

Solution of a system of linear equations with constant coefficients, An equivalent triangular system  
.Degenerate case:  $p_1(D) P_4(D) - P_2(D) P_3(D) = 0$ .

### **Chapter 6(Sections 6.2 to 6.11)**

**[1] Problem Solving Sessions:** Including all Exercise Problems

### **Additional Module: (4HRS)**

Plotting of second order solution family of differential equation- Plotting of third order solution family of differential equation- Growth model (exponential case only)- Decay model (exponential case only).

### **Reference Books:**

**[1]** A Text book of B.Sc Mathematics-Volume I by V.Venkateswara rao , N.Krishna Murthy,

B.V.S.S.Sharma and S.Anjaneya Sastry, published by S.Chand & company , New Delhi.

**[2]** Ordinary and partial Differential equations Raisinghanian , Published by S.chand & company ,New Delhi.

**[3]** A Text Book of Mathematics by Dr.A. Anjaneyulu, Deepti Publications.

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**B.Sc. FIRST YEAR MATHEMATICS**

**B.VOC (PHARMACEUTICAL CHEMISTRY) SYLLABUS**

**PAPER – I**

**SEMESTER –I**

**Paper Code – MAT 124::Differential equations and Descriptive Statistics**

**(For the batch admitted in 2021-2022)**

Total marks: 100

SEE: 50

CIA: 50

Lecture-5, Tutorial -1

Credits: 5

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**OBJECTIVES:**

- To classify differential equations by order, linearity and homogeneity.
- To compute solutions to various differential equations by using analytic techniques.
- To identify the appropriate method for solving the given differential equation.
- To get awareness about the applications.
- To understand and apply the suitable methods to collect data
- To analyze the data using different statistical measures.

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**Unit 1**

**Differential equations of first order and first degree (12 h)**

Exact differential equations, integrating factors, linear Differential equations, Differentialequations reducible to linear form, Change of variables.

**Unit 2**

**Orthogonal Trajectories, Differential equations of the first order**

**But not of the first degree (11 h)**

Orthogonal Trajectories, Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain x (or y); Clairaut's equation.

**Unit -3**

**(11h)**

**Descriptive Statistics:**

Concept of primary and secondary data, methods of collection and editing of primary data- Designing a questionnaire and a schedule- Sources and editing of secondary data- Measures of central tendency (Mean, Median and Mode) with real life examples.

**Unit-4**

**(11h)**

**Measures of Dispersion, Skewness:**

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation- coefficient of variation. -Measures of Skewness: Karl Pearson and Bowley's Coefficient. Concept of moments.

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**B.A./B.Sc. FIRST YEAR MATHEMATICS SYLLABUS**

**For B.Voc. (RENEWABLE ENERGY MANAGEMENT)**

**PAPER – I**

**SEMESTER –I**

**Paper Code -- MAT125:: DIFFERENTIAL EQUATIONS**

**(For the batch admitted in 2021-2022)**

Total marks: 100

SEE: 50

CIA: 50

Lecture-5, Tutorial-1

Credits: 5

**Course Outcomes:**

After successful completion of this course, the student will be able to;

1. Solve linear differential equations
2. Convert non - exact homogeneous equations to exact differential equations by using integrating factors.
3. Know the methods of finding solutions of differential equations of the first order but not of the first degree.
4. Solve higher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients.
5. Understand the concept and apply appropriate methods for solving differential equations.

**Course Syllabus:**

**UNIT-I: Differential Equations of first order and first degree: (15 HRS)**

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables; Orthogonal Trajectories.

**[1]: Chapter 2** (Sections 2.1 to 2.15 & 2.20 to 2.25)

**Problem Solving Sessions:** Including all Exercise Problems

**UNIT- II: Differential Equations of first order but not of the first degree (15 HRS)**

Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain x (or y); Equations homogeneous in x and y; Equations of the first degree in x and y – Clairaut's Equation.

**[1]Chapter 3** (Sections 3.1 to 3.8)

**Problem Solving Sessions:** Including all Exercise Problems

### UNIT –III: Higher Order linear Differential Equations –I (15 HRS)

Solution of homogeneous linear differential equations of order  $n$  with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of  $f(D)y=0$ .

General Solution of  $f(D)y=Q$  when  $Q$  is a function of  $x$ ,  $\frac{1}{f(D)}$  is expressed as partial fractions.

P.I. of  $f(D)y = Q$  when  $Q = be^{ax}$  is expressed as partial fractions.

P.I. of  $f(D)y = Q$  when  $Q$  is  $b \sin ax$  or  $b \cos ax$ .

[1] Chapter 4 (Sections 4.1 to 4.33)

**Problem Solving Sessions:** Including all Exercise Problems

### UNIT –IV: Higher Order linear Differential Equations-II (15 HRS)

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of  $f(D)y = Q$  when  $Q = bx^k$

P.I. of  $f(D)y = Q$  when  $Q = e^{ax}V$ , where  $V$  is a function of  $x$ .

P.I. of  $f(D)y = Q$  when  $Q = xV$ , where  $V$  is a function of  $x$ .

P.I. of  $f(D)y = Q$  when  $Q = x^mV$ , where  $V$  is a function of  $x$ .

[1] Chapter 4 (Sections 4.1 to 4.33)

**Problem Solving Sessions** Including all Exercise Problems

#### Additional Module: (4HRS)

Plotting of second order solution family of differential equation- Plotting of third order solution family of differential equation- Growth model (exponential case only)- Decay model (exponential case only).

#### Reference Books:

[1] A Text book of B.Sc Mathematics-Volume I by V.Venkateswararao , N.Krishna Murthy,B.V.S.S.Sharma and S.AnjaneyaSastry, published by S.Chand& company , New Delhi.

[2] Ordinary and partial Differential equations Raisinghanian , Published by S.chand& company , NewDelhi.

[3] A Text Book of Mathematics by Dr.A. Anjaneyulu, Deepti Publications.

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**II B.Sc. MATHEMATICS SYLLABUS**

**PAPER – III**

**SEMESTER-III**

**Paper Code—MAT 126:: ABSTRACT ALGEBRA**

**(For the batch admitted in 2021-2022)**

Total marks: 100

SEE: 50

CIA: 50

Lecture-5, Tutorial-1

Credits: 5

**UNIT - I (12Hrs) Binary Operation & Groups:-**

Binary operation- Algebraic structure –semi group – monoid –Group definition and elementary properties – Finite and Infinite groups- examples –order of a Group. Composition tables with examples. Order of an element of a group .

[1] Chapter 1 (Section 1.10), Chapter 2 (Sections 2.1 to 2.17)

**Problem Solving Sessions:** Including all Exercise Problems

**UNIT- II ( 12Hrs) SUBGROUPS, COSETS :-**

Complex definition – Multiplication of two complexes - Inverse of a complex-Subgroup definition-examples- criterion for a complex to be a Subgroup-Criterion for the product of two subgroups to be a subgroup – union and intersection of subgroups-Cosets definition –properties of coset –index of a subgroup of a finite group- Lagrange’s Theorem- Applications.

[1] Chapter 3 (Sections 3.1 to 3.6) & Chapter 4 (Sections 4.1 to 4.6 )

**Problem Solving Sessions:** Including all Exercise Problems

**UNIT –III: (12 Hrs ) NORMAL SUBGROUPS, HOMOMORPHISM:-**

Definition of normal subgroup - proper and improper normal subgroup - Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – simple group – quotient group – criteria for the existence of a quotient group.

Definition of homomorphism- Image of homomorphism- Elementary Properties of homomorphism- Isomorphism- Automorphism definitions and elementary properties- Kernel of a homomorphism- Fundamental theorem on homomorphism of groups and applications

[1]Chapter 5 (Sections 5.2 to 5.4)&Chapter 6 (Sections 6.1 to 6.5)

**Problem Solving Sessions:** Including all Exercise Problems

#### **UNIT-IV (12Hrs) PERMUTATIONS AND CYCLIC GROUPS -**

Definition of Permutation - Permutation multiplication- Inverse of a Permutation- Cyclic permutations- Transpositions - Even and Odd Permutations - Alternating Groups - Cayley's Theorem-Applications-Definition of Cyclic Group - Elementary Properties -The classification of Cyclic group-Sub groups of finite cyclic group and applications.

[1] Chapter 7 (Sections 7.1 to 7.6) & Chapter 8 (Sections 8.1 to 8.5)

**Problem Solving Sessions:** Including all Exercise Problems

#### **UNIT-V (12Hrs) RINGS:-**

Definition of Ring and it's basic properties, Boolean ring, Zero divisors of ring, Cancellation laws in a ring, Some special types of rings, Characteristic of ring, Subrings, Ideals

[1] Chapter 9 (Sections 9.1 to 9.12) &Chapter 10 (Sections

10.1 & 10.2)**Problem Solving Sessions:** Including all

Exercise Problems **Additional Module: (5HRS)**

Symmetry of Atomic Orbitals in Chemistry- Group Theory and its Applications in Robotics- Computer Vision & Computer Graphics - Medical Image Analysis-Rubik's Cube

#### **Reference Books :**

[1] A Text book of B.Sc Mathematics-Volume II by V.Venkateswararao , N.Krishna Murthy,B.V.S.S.Sharma and S.AnjaneyaSastry, published by S.Chand& company , New Delhi.

[2] A Text Book of Mathematics by Dr.A. Anjaneyulu, Deepti Publications

[3] "Topics in Algebra " by I N Herstein.

[4] "Modern Algebra" by M.L Khanna .

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**II B.SC MATHEMATICS, SYLLABUS**

**SEMESTER - IV**

**PAPER – V**

Paper Code—MAT 118 :: **LINEAR ALGEBRA**

**(For the batch admitted in 2021-2022)**

Total marks: 100

SEE: 50

CIA: 50

Lecture - 5 , Tutorial -1

Credits:5

**Unit – I – Vector Spaces - I (12 hrs)**

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, linear combination of vectors, Linear span, linear sum of two subspaces, Linear independence and dependence of vectors

[1] Chapter 1 (Sections 1.9 to 1.35)

**Problem Solving Sessions** Including all Exercise Problems

**Unit – II – Vector Spaces - II (12 hrs)**

Basis of vector space, Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace

[1] Chapter 2 (Sections 2.1 to 2.18)

**Problem Solving Sessions:** Including all Exercise Problems

**Unit – III – Linear Transformations (12 hrs)**

Linear Transformations, Linear operators, Range and null space of linear transformation, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation.

[1] Chapter 3 (Sections 3.1 to 3.23) & Chapter 4 (Sections 4.7 to 4.14)

**Problem Solving Sessions:** Including all Exercise Problems

**Unit-IV – Matrices (12 hrs)**

Characteristic vectors and Characteristic values, Cayley – Hamilton theorem and its applications.

[1] Chapter 7 (Sections 7.2 to 7.9)

**Problem Solving Sessions:** Including all Exercise Problems



### **Unit-V – Inner Product Space (12 hrs)**

Inner product spaces, Euclidean and Unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, complete orthonormal set, Gram-Schmidt Orthogonalisation process.

[1] Chapter 8 (Sections 8.3 to 8.5) & Chapter 9 (

Sections 9.2 to 9.5)**Problem Solving Sessions:**

Including all Exercise Problems **Additional Module: (5**

**HRS)**

Use the Wronskian to test a set of solutions of a linear homogeneous Differential equation for linear Independence.- Identify and sketch the Graph of a conic section and Perform a rotation of axis.- Electrical Circuit Problems.

### **Reference Books :**

[1] A Text book of B.Sc Mathematics-Volume III by V.Venkateswararao , N.Krishna Murthy,B.V.S.S.Sharma and S.AnjaneyaSastry, published by S.Chand& company , New Delhi.

[2] A Text Book of Mathematics by Dr.A. Anjaneyulu, Deepti Publications

[3] Linear algebra by J.N.Sharma and A.R.Vasista, Krishna PrakashamMandir,Meerut.

[4] Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education,New Delhi.

[5] Linear Algebra by Stephen H. Friedberg et al Prentice Hall of India Pvt.Ltd. 4<sup>th</sup>edt. 2007.

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**III B.SC, MATHEMATICS SYLLABUS**

**SEMESTER-V**

**PAPER – VI**

Paper Code - MAT 106::NUMERICAL ANALYSIS

(For the batch admitted in 2021-2022)

Total marks: 100

SEE: 50

CIA: 50

Lecture-4 ,Tutorial -1

Credits:5

**Unit-I-(10 hrs)Errors in Numerical Computations:**

Numbers and their Accuracy, Errors and their Computation, Absolute, Relative and percentage errors, a general error formula, Error in a series approximation.

[1] Chapter 1 (Sections 1.1 to 1.4)

**Problem Solving Sessions:** Including all Exercise Problems

**Unit-II-(12 hrs)Solution of Algebraic and Transcendental Equations:**

The bisection method, The iteration method, The method of false position, Newton-Raphson method, Generalized Newton-Raphson method, Ramanujan’s method, Muller’s method.

[1] Chapter 2 (Sections 2.2 to 2.10 , 2.14 to 2.16 & 2.19)

**Problem Solving Sessions:** Including all Exercise Problems

**Unit-III -(12 hrs)Interpolation – I**

Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Differences of a polynomial.

[1] Chapter 3 (Sections 3.2 to 3.5)

**Problem Solving Sessions:** Including all Exercise Problems

#### **Unit-IV-(12 hrs) Interpolation – II**

Newton's formulae for interpolation. Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula.

[1] Chapter 3 (Sections 3.8 to 3.9)

**Problem Solving Sessions:** Including all Exercise Problems

#### **UNIT – V : (14 hours) Interpolation – III**

Interpolation with unevenly spaced points, Lagrange's formula, Error in Lagrange's formula, Divided differences and their properties, Relation between divided differences and forward differences, Relation between divided differences and backward differences, Relation between divided differences and central differences, Newton's general interpolation Formula, Inverse interpolation.

[1] Chapter 3 (Section 3.10 )

**Problem Solving Sessions:** Including all Exercise Problems

#### **Additional Module :**

Network Simulation- Train and Traffic Signals-Weather Prediction-Build up a algorithm-Solving Practical technical problems using scientific and mathematical tools.

#### **Reference Books:**

[1] Numerical Analysis by S.Ranganatham, Dr.M.V.S.S.N Prasad, Dr.V.RameshBabu published by S.Chand& company , New Delhi.

[2] A Text Book of Mathematics by Dr.A. Anjaneyulu, Deepti Publications

[3] Introductory methods of Numerical Analysis by S.S Sastry, Prentice Hall India, New Delhi.

[4] Numerical Analysis by G. SankarRao, New Age Intn. Publishers, New – Hyderabad.