

# ALLIED MATHEMATICS

## Course Structure and Syllabus

(For the candidates admitted from the academic year 2020-2021 onwards)

# CHOICE BASED CREDIT SYSTEM (CBCS)

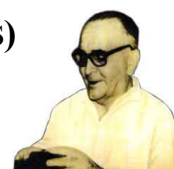


**THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)**

**(Nationally Re-Accredited by NAAC with B<sup>++</sup>)**

**(Affiliated to Bharathidasan University, Tiruchirappalli)**

**ELAMBALUR, PERAMBALUR – 621 220**



## Question Paper Pattern

<b>Mathematics Programme</b>		
<b>Maximum Marks : 75</b>		<b>Duration: 3 Hours</b>
<b>Part – A</b>	<b>20 Multiple Choice Questions</b>	<b>20 x 1 = 20 Marks</b>
<b>Part – B</b> Paragraph	<b>5 Questions (Internal Choice)</b> One set of questions from each unit	<b>5 x 5 = 25 Marks</b>
<b>Part – C</b> Essay Type	<b>3 Questions</b> (Answer any 3 out of 5 Questions) One question from each unit	<b>3 x 10 = 30 Marks</b>
<b>Total</b>		<b>75 Marks</b>

### **MODEL QUESTION PAPER:**

#### **M.Sc., SEMESTER EXAMINATION**

**Time: 3 Hours Maximum Marks - 75**

#### **SECTION – A**

Answer **ALL** of the Following

(20 X 1 = 20 Marks)

#### **SECTION – B**

Answer **ALL** of the Following

(5 X 5 = 25 Marks)

#### **SECTION – C**

Answer any **THREE** of the Following

(3 X 10 = 30 Marks)

**B.Sc. Computer Science, B.Sc. Information Technology & Computer Application**

(For the candidates admitted from the academic year 2020 - 2021 onwards)

**ALLIED MATHEMATICS****ALLIED COURSE - I - NUMERICAL METHODS AND STATISTICS**Course Code: **20UMA1AC1**

Exam Hours: 3

Instruction Hours: 5

Internal Marks: 25

Credits: 3

External Marks: 75

**Course Outcomes**

1. Evaluate algebraic and transcendental equation using numerical methods.
2. Find the solution of linear system of equation by Gaussian Elimination, Method of Factorization, Gauss Jacobi, Gauss Seidel Methods.
3. Evaluate finite integrals using Trapezoidal and Simpsons rule and Solve differential equation and integration.
4. Categorize and evaluate various measures of central tendency.
5. Calculate correlation and regression.

**UNIT – I**

**The Solution of Numerical Algebraic and Transcendental Equations:** Bisection Method - Iteration Method – Regula Falsi Method - Newton Raphson Method – Simple Problems only.

**UNIT – II**

**Solutions of Simultaneous Linear Algebraic Equations:** Gauss Elimination Method – Gauss Jordan Method - Gauss Jacobi - Gauss Seidel Method.

**UNIT – III**

**Numerical solution of ODE:** Taylor Series Method - Euler’s Method - Runge– Kutta Second and Fourth order method.

**Numerical Integration:** Trapezoidal Rule - Simpson’s Rule (Proof not needed).

**UNIT – IV**

**Measures of Central Tendency:** Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean. **Measures of Dispersion:** Range – Quartile Deviation - Standard Deviation.

**UNIT – V**

**Correlation and Regression:** Introduction – Scatter Diagram -Karl Pearson Co-efficient of Correlation – Rank Correlation- Lines of Regression- Simple Problems only.

**TEXT BOOK(S):**

1. S.S.Sastry, “Introductory Methods of Numerical Analysis”, PHI Learning Pvt.Ltd, New Delhi 2010.
2. Gupta.S.C & Kapoor, V.K, “Fundamentals of Mathematical Statistics”, Sultan Chand & sons, New Delhi 1994.

UNIT – I	Chapter – 2	Sections 2.2, to 2.5 of [1]
UNIT – II	Chapters – 6& 8	Sections 6.3.2 to 6.3.3& 8.3.1 to 8.3.2 of [1]
UNIT – III	Chapters – 7 & 5	Sections 7.2, 7.4, 7.5 & 5.4.1 to 5.4.3 of [1]
UNIT – IV	Chapters – 2& 3	Sections 2.3 to 2.5.2, 2.6 to 2.9.1 & 3.3 – 3.5, 3.7 of [2]
UNIT – V	Chapter – 10	Sections 10.1 to 10.3, 10.3.1, 10.6, 10.7 & 10.7.1 of [2]

**REFERENCE(S):**

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, “Numerical Methods for Scientific and Engineering Computation”, New Age International Private Limited, 1999.
3. C.E. Froberg, “Introduction to Numerical Analysis”, II Edn., Addison Wesley, 1979.
4. P. Kandasamy, K.Thilagavathy, Calculus of Finite Differences and Numerical Analysis (Allied Mathematics), S.Chand & Co. Ltd, New Delhi.

## Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	20UMA1AC1	NUMERICAL METHODS AND STATISTICS					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3		✓	✓	✓		✓		✓			
CO4		✓		✓			✓	✓			
CO5	✓	✓			✓	✓	✓		✓	✓	
Number of Matches (✓) = 36						Relationship: <b>HIGH</b>					

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

**B.Sc. Computer Science, B.Sc. Information Technology, Computer Application**

(For the candidates admitted from the academic year 2020 - 2021 onwards)

**ALLIED MATHEMATICS**

**ALLIED COURSE - II - OPERATIONS RESEARCH**

Course Code: **20UMA2AC2**

Exam Hours: 3

Instruction Hours: 5

Internal Marks: 25

Credits: 3

External Marks: 75

**Course Outcomes**

1. Recognize and relate LPP and solving LPP using graphical method.
2. Compute Simplex Algorithm, Two Phase Method and Big-M Method of LPP.
3. Explain Transportation problem and Evaluate its initial basic feasible solution.
4. Discuss and solve assignment problem using Hungarian algorithm.
5. Describe and Construct Network and compute PERT and CPM.

**UNIT – I**

**Linear Programming Problem:** Introduction - Graphical Solution Method – General Linear Programming Problem - Canonical and Standard forms of LPP.

**UNIT – II**

**Linear Programming Problem (Continued):** Introduction - Simplex Method for  $<$ ,  $=$ ,  $>$  constraints – Big-M Method.

**UNIT – III**

**Transportation Problem:** Introduction – LP formulation of the Transportation Problem – Finding an Initial Basic Feasible Solution - Transportation Algorithm (Modi Method) – Unbalanced Transportation Problem.

**UNIT – IV**

**Assignment Algorithm:** Introduction- Mathematical Formulation of the Problem – Solution Methods of Assignment Problem – Special Cases in Assignment Problems.

**UNIT – V**

**Networks:** Introduction – Network (Basic Components) – Logical Sequencing – Rules of Networking Construction – Concurrent Activities - CPM computation- PERT computation.

**TEXT BOOK:**

1. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Co. Ltd. 2012  
UNIT – I Chapter – 3 Sections 3.1 to 3.5  
UNIT – II Chapter – 4 Sections 4.1, 4.3 & 4.4  
UNIT – III Chapter – 10 Sections 10.1, 10.2, 10.9 to 10.13 & 10.15  
UNIT – IV Chapter – 11 Sections 11.1 to 11.4  
UNIT – V Chapter – 25 Sections 25.1 to 25.7.

**REFERENCE(S):**

1. Prem Kumar, Gupta and D.S. Hira, “Operations Research”, An Introduction, S. Chand and Co., Ltd. New Delhi,
2. Hamdy A. Taha, “Operations Research”, Seventh Edition, McMillan Publishing Company, New Delhi, 1982.

## Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
II	20UMA2AC2	OPERATIONS RESEARCH					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓		✓	✓		✓	✓	✓	✓		
CO2	✓		✓	✓	✓	✓		✓	✓		
CO3		✓	✓		✓	✓		✓	✓	✓	
CO4		✓			✓		✓	✓		✓	
CO5	✓	✓		✓	✓		✓			✓	
Number of Matches (✓) = 32						Relationship: <b>MODERATE</b>					

<b>Mapping</b>	1-29%	30-59%	60-69%	70-89%	90-100%
<b>Matches</b>	1-14	15-29	30-34	35-44	45-50
<b>Relationship</b>	Very Poor	Poor	Moderate	High	Very High

**B.Sc., PHYSICS**

(For the candidates admitted from the academic year 2020-21 onwards)

**ALLIED MATHEMATICS****ALLIED COURSE - I – ALGEBRA AND CALCULUS**Course Code: **20UMA1AC1:1**

Exam Hours: 3

Instruction Hours: 5

Internal Marks: 25

Credits: 3

External Marks: 75

**Course Outcomes**

1. To find maxima and minima, critical points and inflection points of functions
2. Solving technique of integrals and Integration by parts
3. Discuss and demonstrate the Linear Equations with constant coefficients, Complementary function and Particular integrals.
4. Understand the importance of roots of real and complex polynomials and learn various methods of obtaining roots
5. Solve systems of linear equations by use of the matrix.

**UNIT – I**

**Differentiation:** Maxima & Minima – Concavity, Convexity – Points of inflexion - Partial differentiation – Euler's Theorem - Total differential coefficients (proof not needed) – Simple problems only.

**UNIT II**

**Integration:** Evaluation of integrals of types 1.  $\int \frac{px+q}{ax^2+bx+c} dx$  2.  $\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx$  3.  $\int \frac{dx}{a+b\sin x}$   
4.  $\int \frac{dx}{a+b}$  - Evaluation using Integration by parts – Properties of definite integrals

**UNIT III**

**Differential Equations:** Variables Separables – Linear equations – Second order of types  $(aD^2 + bD + c)y = F(x)$  where a,b,c are constants and F(x) is one of the following types (i)  $e^{Kx}$  (ii)  $\sin(kx)$  or  $\cos(kx)$  (iii)  $x^n$ , n being an integer (iv)  $e^{Kx} f(x)$

**UNIT IV**

**Theory of Equations:** Relation between roots & coefficients – Transformations of Equations – Diminishing, Increasing & Multiplying the roots by a constant- Rolle's Theorem, Descartes' rule of Signs (statement only) – Simple problems.

**UNIT V**

**Matrices :** Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Consistency – Characteristic equation, Eigen values, Eigen vectors – Cayley Hamilton's Theorem (proof not needed) – Simple applications only

**TEXT BOOK(S):**

1. T.K. Manickavasagam Pillai & Others, Algebra, Vol I, S.V Publications, 2004 (Unit I)
2. T.K. Manickavasagam Pillai & Others, Algebra, Vol II, S.V Publications, Pvt. Ltd 2011. (Unit II)
3. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. I, S. Viswanathan Pvt Limited, 2010. (Units III)
4. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. II, S. Viswanathan Pvt Limited, 2011. (Units IV)
5. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. III, S. Viswanathan Pvt Limited, 2008 (Units V)

UNIT – I	Chapter – 6	Sections 11, 15, 17, 18, 24, 25 of [1]
UNIT – II	Chapter – 2	Sections 1 to 16 of [2]
UNIT – III	Chapters – 5 & 8	Sections 1, 2 & 1.1 to 1.6 of [3]
UNIT – IV	Chapter – 1	Sections 7, 8, 9, 11, 12 of [4]
UNIT – V	Chapter – 1 & 2	Sections 2.1, 2.4 & 1 to 4 of [5]

**REFERENCE:**

1. M.L. Khanna, Differential Calculus, Jaiprakashnath and Co., Meerut-2004.
2. S. RethinaKumar, “Algebra and Calculus”, Sai Publication – 2015.

## Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	20UMA1AC1:1	ALGEBRA AND CALCULUS					5	3			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓				✓	✓	✓	
CO2	✓	✓	✓	✓		✓	✓	✓	✓	✓	
CO3	✓				✓	✓	✓				
CO4		✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5		✓	✓	✓			✓	✓		✓	
Number of Matches (✓) = 35					Relationship: <b>HIGH</b>						

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High



**B.Sc., PHYSICS**

(For the candidates admitted from the academic year 2020-21 onwards)

**ALLIED MATHEMATICS****ALLIED COURSE - II - ANALYTICAL GEOMETRY (3D), TRIGONOMETRY AND FOURIER SERIES**Course Code: **20UMA2AC2:1**

Exam Hours: 3

Instruction Hours: 4

Internal Marks: 25

Credits: 3

External Marks: 75

**Course Outcomes**

1. Describe the equation of a straight line passing through two given points and shortest distance between two skew lines.
2. Finding centre, radius and length of the tangent plane to a sphere.
3. Expansion of  $\sin nx$ ,  $\cos nx$ ,  $\tan nx$  and powers of sines and cosines in terms of functions of multiples of  $\theta$
4. Define and illustrate the concept of hyperbolic functions
5. Find Odd and Even function, Half range Fourier series.

**UNIT – I**

Equation of a straight line passing through two given points - Condition for a line to be parallel to a plane - Coplanar lines - Shortest distance between two given lines – Simple problems.

**UNIT – II**

Equation of a sphere - Finding centre and radius - Length of the tangent to a sphere - Plane section of a sphere.

**UNIT – III**

Expansion of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  (n being a positive integer) - Expansion of  $\sin^n\theta$ ,  $\cos^n\theta$ ,  $\sin^m\theta \cos^m\theta$  in a series of sines & cosines of multiples of  $\theta$  ( $\theta$  - given in radians) - Expansion of  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$  in terms of powers of  $\theta$  (only problems in all the above).

**UNIT – IV**

Euler's formula for  $e^{i\theta}$  - Definition of Hyperbolic functions – Formulae involving Hyperbolic functions -Relation between Hyperbolic & circular functions – Expansion of  $\sin hx$ ,  $\cosh x$ ,  $\tan hx$  in powers of x

**UNIT – V**

Definition of Fourier series – Finding Fourier Coefficients for a given periodic function with period  $2\pi$  - Use of Odd & Even functions in evaluating Fourier Coefficients - Half range sine & cosine series.

**TEXT BOOK(S):**

1. T.K.Manickavasagom Pillai, T.Natarajan, “Analytical Geometry (3D)” Part-II, S. Viswanathan (Printers & Publishers, Pvt Limited, 2011).
2. S. Narayanan, T.K. Manichavasagam Pillai, “ Trigonometry”, S. Viswanathan (Printers & Publishers, Pvt Limited, 2011).
3. S.Narayanan, T.K. Manichavasagam Pillai, “Calculus” Volume – III, S. Viswanathan(Printers & Publishers, Pvt Limited, 2011).

UNIT – I	Chapter – 3	Sections 4, 5, 7 & 8 of [1]
UNIT – II	Chapter – 4	Sections 2 to 5 of [1]
UNIT – III	Chapter – 3	of [2]
UNIT – IV	Chapter – 4	Sections 1, 2 (2.1, 2.2) of [2]
UNIT – V	Chapter – 6	Sections 1 to 5 of [3]

## Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits						
II	20UMA2AC2:1	ANALYTICAL GEOMETRY (3D), TRIGONOMETRY AND FOURIER SERIES	4	3						
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓				✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓			✓
CO4			✓	✓	✓			✓	✓	✓
CO5	✓	✓	✓			✓	✓	✓		
Number of Matches (✓) = 35					Relationship: <b>HIGH</b>					

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High