Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS101	**Title**	**Batch:**	2026 - 2029
		CLASSICAL ALGEBRA	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This course provides the learners a wide spectrum of basic mathematical concepts including summation of series, roots of an equation and matrices.

Course Outcomes

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

CO Number	CO Statement	
CO1	Recall fundamental theorems on convergence/divergence of series, binomial and logarithmic expansions, theory of equations, and matrix concepts.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain the methods for testing convergence of series, summation techniques, symmetric functions of roots, and properties of matrices and characteristic vectors.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(2)PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Apply tests for series convergence, summation formulas, polynomial root methods, and matrix operations to solve numerical and algebraic problems.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze series, equations, and matrices to determine convergence, roots, characteristic values, and diagonalization possibilities.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate solutions of numerical equations, series summations, and matrix transformations to justify correctness and efficiency of the methods used.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), , PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	2	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	2	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Convergency and Divergency of Series:** Some general theorems concerning infinite series – Series of positive terms – Comparison tests – Cauchy's condensation test – D'Alembert's Ratio test – Cauchy's Root test –Raabe's test. **Text Book 1: Chapter 2: Sections: 11-20**.	15
Unit II	**Binomial theorem:** Application of Binomial theorem to summation of series. **Exponential and logarithmic series:** The Exponential theorem – Summation - The logarithmic series - Modification of the Logarithmic series - Series which can be summed up by the logarithmic series. **Summation of series:** Application of partial fractions. **Text Book 1: Chapter 3: Section: 10.** **Chapter 4: Sections: 2.3, 3.1, 5- 7,9, 9.1 (No derivations).** **Chapter 5: Sections: 2.1, 3.1, 3.2.**	15
Unit III	**Theory of equations:** Symmetric function of roots- Newton's Theorem on the sum of powers of the roots – To increase or decrease the roots of a given equation by a given quantity – Form of the quotient and remainder when a polynomial is divided by a binomial – *Removal of terms (Self study)*. **Text Book 1: Chapter 6:Sections: 12, 14 17-19.**	15
Unit IV	**Theory of equations**: Multiple roots – Strum's theorem – Solutions of numerical equations – Newton's method of divisors – Horner's Method. **Text Book 1: Chapter 6: Sections: 26, 27, 28.1-28.3, 29.4, 30**.	15
Unit V	**Fundamental Concepts:** Nilpotent – Idempotent – Unitary – Orthogonal Matrices – Related Problems. **Characteristic roots and Characteristic vectors**: The Characteristic equation of transformation-Properties of the Eigen vectors - Cayley-Hamilton theorem (statement only)-Diagonalization of a Matrix. **Text Book 2: Chapter 1.** **Text Book 2: Chapter 4.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

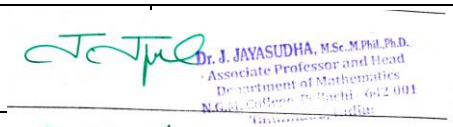
1. Manicavachagompillay T. K, Natarajan T. and Ganapathy K. S, *Algebra Volume I*, S. Viswanathan Pvt. Ltd,First edition, 2010.
2. Kandasamy P. and Thilagavathi K, *Mathematics for B. Sc. Branch - I, Volume II*, First Edition, 2004.

Books for Reference:

1. Ray M. and Sharma H. S, *A text book of Higher Algebra*, S. Chand & Company, 1988
2. Thakur B. R, Sinha H. C, Agarwal B. L. and Johri V. B,*A text book of Algebra*, Ram Prasad & sons, 1970.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=BydVprh9NgQ
2. https://youtu.be/a05NS7dpbNM

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS102	**Title**	**Batch:**	2026 - 2029
		CALCULUS	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This paper enables the students to gain the ability to solve the problems related to multiple integrals, Beta and Gamma functions. It also provides the basic knowledge about Laplace transforms and use it to solve the differential equations.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	
CO1	Recollect the fundamental concepts of envelopes, curvature, radius and centre of curvature, higher-order differential equations, multiple integrals, Jacobians, Beta and Gamma functions, and Laplace transforms.	PO1(3), PO2(1), PO3(1), PO5(1), PO8(1), PO15(1)
CO2	Understand the methods of finding envelopes, curvature, evolutes and involutes, solving linear differential equations with constant coefficients, evaluation of multiple integrals, properties of Beta and Gamma functions, and basic Laplace transforms.	PO1(3), PO2(1), PO3(2), PO4(1), PO5(2), PO8(2), PO11(1), PO15(1)
CO3	Apply appropriate techniques to compute curvature, radius and centre of curvature, solve higher-order linear differential equations, evaluate double and triple integrals, perform change of variables using Jacobians, and compute Laplace transforms.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze problems involving transformation of variables, Jacobians in multiple integrals, applications of Beta and Gamma functions, and the use of Laplace transforms in solving differential equations.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate and justify solutions of complex problems involving curvature of curves, multiple integrals, Beta and Gamma functions, and Laplace transforms, and interpret results in mathematical and applied contexts.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(2), PO9(1), PO10(1), PO11(2), PO13(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	1	–	–	–	–	–	–	1		
CO2	3	1	2	1	2	–	–	2	–	–	1	–	–	–	1		
CO3	3	1	3	3	3	1	1	2	–	1	1	–	–	–	2		
CO4	3	1	3	3	3	1	1	2	1	1	1	–	–	–	2		
CO5	3	2	3	3	3	1	1	2	1	1	2	–	1	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Envelops, Curvatures Of Plane Curves:** Envelops – Method of finding the envelope - Curvature – Circle, radius and Centre of curvature – Cartesian formula for the radius of curvature – The co-ordinates of the centre of curvature – Evolute and involute – Radius of curvature when the curve is given in polar co-ordinates – pedal equation of a curve - Examples. **Text Book 1: Chapter 10: Sections: 1 and 2.**	15
Unit II	**Linear Differential Equations With Constant Coefficients:** Differential equation of higher order- The operators D and D^{-1} – Particular integral - Special methods of finding particular integral - Linear equations with variable coefficients – To find the particular integral – Special method of evaluating the P.I. when X is of the form x^m. **Text Book 3: Chapter 2: Sections: 1 - 4 & 8.**	15
Unit III	**Multiple Integrals:** Definition of double integral - Evaluation of the double integral - Double integral in polar co-ordinates - Triple integrals – Applications of multiple integrals (problems only) **Text Book 2: Chapter 5: Sections: 1 - 5.**	15
Unit IV	**Change of Variables:** Jacobians - Two important results regarding Jacobians - Change of variable in the case of two variables - Change of variable in the case of three variables - Transformation from Cartesian to polar co-ordinates - Transformation from Cartesian to spherical polar co-ordinates. **Beta and Gamma Functions:** Definitions - Convergence of Gamma functions - Properties of Beta functions - Relation between Beta and Gamma functions - Examples - Applications of Gamma functions to multiple integrals. **Text Book 2:Chapter 6: Sections 1 - 4.&Chapter 7: Sections 2 - 6.**	15
Unit V	**The Laplace Transforms:** Definitions - Transform off(t), e^{at}, cos at, sin at and tn when n is an integer - Using Laplace transforms to evaluate integrals - Inverse Laplace transforms (Self-study)- Finding the Laplace transforms of functions to get the inverse transforms of functions--Laplace transforms to solve ordinary differential equation with constant coefficients. **Text Book 3: Chapter 5: Sections 1,2,4 - 8.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

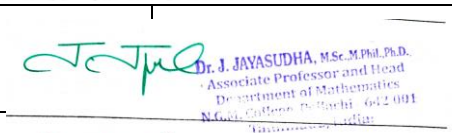
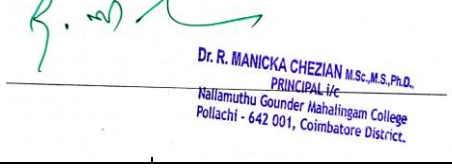
1. Narayanan S. and Manicavachagom Pillay T.K, Calculus Volume – I, S. Viswanathan (Publishers and Printers), 2010.
2. Narayanan S. and Manicavachagom Pillay T.K, Calculus Volume – II, S. Viswanathan (Publishers and Printers), 2010.
3. Narayanan S. and Manicavachagom Pillay T. K, Calculus Volume – III, S. Viswanathan (Publishers and Printers), 2010.

Books for Reference:

1. Dass H. K., Advanced Engineering MathematicsS. Chand and Company Ltd, Sixteenth Edition, New Delhi, 2006.
2. Kandasamy P. and Thilagavathi K., Allied Mathematics (Volume-II), S. Chand and company Ltd, New Delhi, 2004.
3. Kandasamy P. and Thilagavathi K., Allied Mathematics (Volume-III), S. Chand and company Ltd, New Delhi, 2004

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. http://www.math.odu.edu/~jhh/Volume-2.PDF
2. https://nptel.ac.in/courses/111/105/111105122/
3. https://nptel.ac.in/courses/111/107/111107108/

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS1A1	**Title**	**Batch:**	2026 - 2029
		MATHEMATICAL STATISTICS- I	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objectives

The aim of this course is to introduce the concept of discrete and continuous random variables, probability functions, expectations, moment generating functions and some discrete and continuous distributions and should have developed skills to apply them to various real life situations.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	
CO1	Recall definitions and fundamental concepts of random variables, probability distributions, expectation, moments, and special discrete and continuous distributions.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain joint, marginal, and conditional distributions, properties of expectation, variance, covariance, moment generating functions, and characteristic functions.	PO1(3), PO2(2), PO3(2), PO4(2), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Apply probability theory and distribution properties to compute expected values, variances, covariances, and solve simple problems involving discrete and continuous distributions.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze bivariate and univariate distributions, linear combinations of random variables, and use MGF/CGF and cumulants to study distribution characteristics.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate and interpret results from probability distributions, validate properties of binomial, Poisson, normal, rectangular, gamma, beta, and exponential distributions in real-world problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	2	2	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Random Variables and Distribution Functions:** Introduction- Two Dimensional or Joint Probability Mass Function - Two Dimensional Distribution function - Marginal Distribution functions - Joint Density function - Marginal Density Function - The conditional Distribution Function and Conditional Probability Density function - Simple problems. **Chapter 5: Sections: 5.1,5.5, 5.5.1 - 5.5.5.** **Mathematical Expectation:** Introduction - Mathematical Expectation or Expected value of Random variable – Expected value of function of a Random variable - Properties of Expectation. **Chapter 6: Sections: 6.1-6.4.**	18
Unit II	**Mathematical Expectation:** Properties of Variance - Covariance – Variance of a linear combination of Random variables - Moments of Bivariate Probability Distributions - Conditional Expectation and Conditional Variance - Simple problems. **Chapter 6: Sections: 6.5, 6.6, 6.6.1, 6.8, 6.9.** **Moment Generating Functions**: Moment Generating Functions - Properties of Moment Generating Functions – Uniqueness Theorem of Moment Generating Functions - Cumulants - *Properties of Cumulants (Self study)* - Simple problems. **Chapter 7: Sections: 7.1, 7.1.2, 7.1.3, 7.2, 7.2.1.**	18
Unit III	**Moment Generating Functions**: *Characteristic Function (Self study)* - Properties of Characteristics Function - Chebychev's inequality - Simple problems. **Chapter 7: Sections: 7.3, 7.3.1, 7.5.** **Special Discrete Probability Distributions:** Binomial distribution - Moments of Binomial Distribution - Recurrence Relation for the Moments of Binomial Distribution - Moment Generating function of Binomial Distribution - Additive property of Binomial Distribution- Simple problems. Poisson distribution - Moments of Poisson distribution - Recurrence relation of Moments of the Poisson distribution - Moment Generating function of Poisson Distribution - Characteristics Function of the Poisson distribution – Cumulants of the Poisson distribution- Additive or reproductive property of independent Poisson variates - Simple problems. **Chapter 8: Sections: 8.4, 8.4.1, 8.4.2, 8.4.6, 8.4.7, 8.5, 8.5.2, 8.5.4-8.5.8**	18
Unit IV	**Special Continuous Probability Distributions:** Normal distribution - Chief Characteristics of the Normal Distribution - M.G.F. of Normal distribution - C.G.F. of Normal distribution - Moments of Normal Distribution - A linear combination of independent normal variates - Simple problems. Rectangular distribution - Moments of Rectangular distribution - MGF of Rectangular distribution - Characteristic function of Rectangular distribution - Mean Deviation about Mean -Simple problems. **Chapter 9: Sections: 9.2, 9.2.2, 9.2.5, 9.2.6, 9.2.7, 9.2.8, 9. 3-9.3.4.**	18

Unit V	**Special Continuous Probability Distributions:** Gamma Distribution - M.G.F. of Gamma distribution - C.G.F. of Gamma distribution - Additive property of Gamma Distribution - Beta distributions of first kind - Constants of Beta distributions of first kind - Beta distributions of second kind - Constants of Beta distributions of second kind - Exponential distribution - M.G.F. of Exponential distribution - Simple problems. **Chapter 9: Sections: 9.5-9.5.3, 9.6, 9.6.1, 9.7, 9.7.1, 9.8, 9.8.1.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Gupta S. C. and Kapoor V. K., *Fundamentals of Mathematical Statistics, Eleventh Edition* S.Chand& Sons, 2009.

Books for Reference:

1. Hogg R.V. and Craigh A. G., *Introduction to Mathematical Statistics,* Pearson Education publications, 2004.
2. Veerarajan T., *Fundamentals of Mathematical Statistics,* Yes Dee Publishing Pvt.Ltd, 2017.
3. Vital P. R., *Mathematical Statistics,* Margham publications, 2004.

Digital Demonstration using R

http://www.r-tutor.com/elementary-statistics/numerical-measures/mean ϖ

Finding mean

http://www.r-tutor.com/elementary-statistics/numerical-measures/median ϖ

Finding median

http://www.r-tutor.com/elementary-statistics/probability-distributions/binomial-distribution

Binomial distribution

http://www.r-tutor.com/elementary-statistics/probability-distributions/poisson-distribution

ϖ**Poisson distribution**

http://www.r-tutor.com/elementary-statistics/hypothesis-testing

Course Designed by	Dr. M. MAHESWARI	M.Malleli
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UCY	**ProgrammeTitle :**	B.Sc., Chemistry	
Course Code:	26UCY1A1	**Title**	**Batch :**	2026 - 2029
		MATHEMATICS FOR CHEMISTRY-I	**Semester**	I
Hrs/Week	5		**Credits :**	4

Course Objective

This course provides a platform to understand the fundamental concepts of Matrices, Theory of Equations, Summation of series and some Special functions.

Course Outcomes

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

CO Number	CO Statement	
CO1	Identify and analyze different types of matrices such as symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal, and unitary matrices, and compute characteristic equations and eigenvectors using Cayley–Hamilton theorem.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO2	Understand the fundamental concepts of the theory of equations, including the relationship between roots and coefficients, and solve problems involving imaginary, irrational, reciprocal equations, and transformations of equations.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO3	Apply binomial, exponential, and logarithmic series to solve summation problems and simplify mathematical expressions.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(2), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO4	Solve systems of simultaneous linear algebraic equations using direct methods such as Gauss elimination, Gauss–Jordan elimination, and compute matrix inverses using these methods.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(2), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate and apply Beta and Gamma functions to solve basic problems in mathematical analysis.	PO1(3), PO2(1), PO3(2), PO4(2), PO5(3), PO6(1), PO8(2), PO9(1), PO10(2), PO11(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	3	3	–	–	2	1	1	1	–	–	–	2		
CO2	3	1	2	3	3	–	–	2	1	1	1	–	–	–	2		
CO3	3	1	2	3	2	–	–	2	1	1	1	–	–	–	2		
CO4	3	1	3	3	3	2	1	2	1	2	1	–	–	–	2		
CO5	3	1	2	2	3	1	–	2	1	2	1	–	–	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Matrices:** Symmetric and Skew Symmetric matrices - Hermitian and Skew - Hermitian matrices - Orthogonal and unitary matrices - Characteristic Equation of a matrix – Characteristic vectors of a matrix - Cayley-Hamilton's theorem (without proof) - Simple Problems. **Text Book 1: Chapter 5** **(Page No. 5.8 - 5.24 and 5.50 - 5.75)**	15
Unit II	**Theory of Equations:** Fundamental theorem in the theory of Equations - Relation between the roots and co-efficient of an Equation - Imaginary and Irrational roots. **Text Book 1: Chapter 6: Sections: 1- 4** **(Page No. 6.1 - 6.26)** Reciprocal Equation - Diminishing the roots of an Equation - Removal of term - Simple Problems. **Text Book 1: Chapter 6 : Sections: 6, 9, 10** **(Page No.6.30 - 6.37 and 6.49 - 6.56)**	15
Unit III	**Binomial Series:** Summation of Binomial Series - Exponential series - Logarithmic series - Simple Problems. **Text Book 1: Chapter 2: Sections: 3 (Page No. 2.4 - 2.21)** **Chapter 3 Sections: 1, 2 (Page No. 3.1 - 3.23)** **Chapter 4 (Page No. 4.1 - 4.21)**	15
Unit IV	**Solution of Simultaneous Linear Algebraic Equations – Direct Methods:** Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method **Text Book 2: Chapter 4: Sections: 4.1 – 4.3**	15
Unit V	Beta, Gamma Functions - Simple Problems. **Text Book 1: Chapter 30 (Page No.30.1 - 30.31)**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

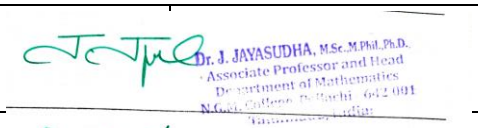
1. Dr. Vittal P. R, *Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.
2. Kandasamy P, Thilagavathy K and Gunavathi K, Numerical Methods, S. Chand company Ltd, 2012.

Books for Reference :

Frank Ayres, *Shaum's outline of theory and problem of matrices.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=xyAuNHPsq-g
2. https://www.youtube.com/watch?v=JoyvDWZ0aMY

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UPS	Programme Title:	B.Sc., Physics	
Course Code:	26UPS1A1	Title	Batch :	2026 - 2029
		MATHEMATICS FOR PHYSICS – I	Semester	I
Hrs/Week	5		Credits :	4

Course Objective

This course provides a platform to understand the fundamental concepts of Matrices, Theory of Equations, Summation of series and some Special functions.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Identify and analyze different types of matrices such as symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal, and unitary matrices, and compute characteristic equations and eigenvectors using Cayley–Hamilton theorem.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO2	Understand the fundamental concepts of the theory of equations, including the relationship between roots and coefficients, and solve problems involving imaginary, irrational, reciprocal equations, and transformations of equations.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO3	Apply binomial, exponential, and logarithmic series to solve summation problems and simplify mathematical expressions.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(2), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO4	Solve systems of simultaneous linear algebraic equations using direct methods such as Gauss elimination, Gauss–Jordan elimination, and compute matrix inverses using these methods.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(2), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate and apply Beta and Gamma functions to solve basic problems in mathematical analysis.	PO1(3), PO2(1), PO3(2), PO4(2), PO5(3), PO6(1), PO8(2), PO9(1), PO10(2), PO11(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	3	3	–	–	2	1	1	1	–	–	–	2		
CO2	3	1	2	3	3	–	–	2	1	1	1	–	–	–	2		
CO3	3	1	2	3	2	–	–	2	1	1	1	–	–	–	2		
CO4	3	1	3	3	3	2	1	2	1	2	1	–	–	–	2		
CO5	3	1	2	2	3	1	–	2	1	2	1	–	–	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Matrices:** Symmetric and Skew Symmetric matrices - Hermitian and Skew - Hermitian matrices - Orthogonal and unitary matrices - Characteristic Equation of a matrix – Characteristic vectors of a matrix - Cayley-Hamilton's theorem (without proof) - Simple Problems. **Text Book 1: Chapter 5** **(Page No. 5.8 - 5.24 and 5.50 - 5.75)**	15
Unit II	**Theory of Equations:** Fundamental theorem in the theory of Equations - Relation between the roots and co-efficient of an Equation - Imaginary and Irrational roots. **Text Book 1: Chapter 6: Sections: 1- 4** **(Page No. 6.1 - 6.26)** Reciprocal Equation - Diminishing the roots of an Equation - Removal of term - Simple Problems. **Text Book 1: Chapter 6 : Sections: 6, 9, 10** **(Page No.6.30 - 6.37 and 6.49 - 6.56)**	15
Unit III	**Binomial Series:** Summation of Binomial Series - Exponential series - Logarithmic series - Simple Problems. **Text Book 1: Chapter 2: Sections: 3 (Page No. 2.4 - 2.21)** **Chapter 3 Sections: 1, 2 (Page No. 3.1 - 3.23)** **Chapter 4 (Page No. 4.1 - 4.21)**	15
Unit IV	**Solution of Simultaneous Linear Algebraic Equations – Direct Methods:** Introduction - Gauss Elimination Method – Gauss Jordan Elimination Method - Inversion of a matrix using Gauss Elimination Method **Text Book 2: Chapter 4: Sections: 4.1 – 4.3**	15
Unit V	Beta, Gamma Functions - Simple Problems. **Text Book 1: Chapter 30 (Page No.30.1 - 30.31)**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

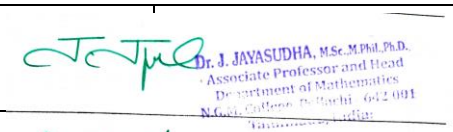
1. Dr. Vittal P. R,*Allied Mathematics*, Fourth Edition, Margham Publications, Chennai, 2010.
2. Kandasamy P, Thilagavathy K and Gunavathi K, Numerical Methods, S. Chand company Ltd, 2012.

Books for Reference :

Frank Ayres, *Shaum's outline of theory and problem of matrices.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=xyAuNHPsq-g
2. https://www.youtube.com/watch?v=JoyvDWZ0aMY

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS203	**Title**	**Batch:**	2026 - 2029
		TRIGONOMETRY, VECTORCALCULUS AND FOURIER SERIES	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This paper enables the students to provide basic knowledge of trigonometry, vector calculus and Fourier series.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall expansions of trigonometric and inverse trigonometric functions, circular and hyperbolic functions, and basic concepts of vector calculus.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain relations among trigonometric, inverse, circular, and hyperbolic functions, Fourier coefficients, and vector differential and integral operations.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Apply series expansions, Fourier series, and vector differentiation/integration techniques to solve mathematical and physical problems.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze scalar and vector fields, level surfaces, line, surface, and volume integrals, and use vector theorems to solve related problems.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate Fourier series, vector operations, and integrals to verify properties, solve applied problems, and interpret mathematical and physical results.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	2	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Expansions and Inverse circular functions: Expansions of $\cos^n \theta$ and $\sin^n \theta$ - Expansions of $\cos n\theta$ and $\sin n\theta$ - Power series for sin x and cos x – Trigonometric equations – Relations among inverse functions - Related problems **Text Book 1: Chapter 4: Sections: 4.1-4.5.**	15
Unit II	Circular and Hyperbolic Functions: Exponential function - Circular functions - hyperbolic functions - Relations between circular and hyperbolic functions- Related problems. **Text Book 1: Chapter 6: Sections: 6.1 – 6.4.**	15
Unit III	Fourier Series: Definition - Finding Fourier co-efficient for given periodic functions with period 2π and $2l$ - Even and odd functions - Half range series. **Text Book 2: Chapter 6: Sections: 1 – 6.1.**	15
Unit IV	Vector differentiation: Gradient, Curl and Divergence- Scalar and vector point functions - Level surface - Gradient of a scalar point function - Directional derivative of a scalar point function - Theorems (statement only) - Equations of tangent plane and normal line to a level surface (Self study) - Divergence and curl of a vector point function - Solenoidal vector - Irrotational vector - Vector identities. **Text Book 3: Chapter 1.**	15
Unit V	Vector integration: Line integral - Theorems on line integrals - Surface and Volume integrals - Gauss Divergence theorem - Stoke's theorem - Green's theorem in plane. (Statement only and relevant problems). **Text Book 3: Chapter 2.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

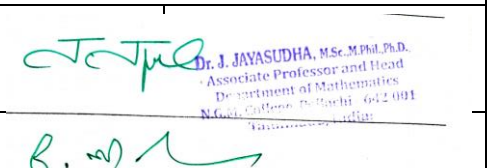
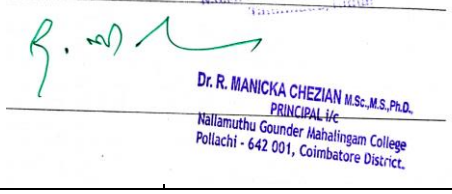
1. Duraipandian P., LaxmiDuraipandian and Jayamalaparamasivan, Trigonometry, Emerald Publishers, 1999.
2. Narayanan S., ManicavachagomPillay T. K., Calculus Volume III, Viswanathan S (Publishers and Printers), 2010.
3. Vittal P. R. and Malini V., Vector Analysis, Margham Publication, 1997.

Books for Reference:

1. Gupta R., Vector Calculus, Firewall Media, 2005.
2. Narayanan S. and Manicavachagompillay T. K., Trigonometry, Viswanathan S (Publishers and Printers), 2012.
3. Duraipandian P. and UdhayabaskaranS., Allied Mathematics, Vol 1, S. Chand, Reprint 2019.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/105/111105122/
2. http://www.math.odu.edu/~jhh/Volume-2.PDF
3. https://www.whitman.edu/mathematics/calculus_online/chapter16.html
4. https://nptel.ac.in/courses/111/107/111107108/

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS204	**Title**	**Batch:**	2026 - 2029
		ANALYTICAL GEOMETRY	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	4

Course Objective

This paper enables the student to gain fundamental ideas about co-ordinate geometry and gives clear knowledge about regular geometrical aspects and their properties in two and three dimensions.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall definitions and fundamental concepts of coordinate geometry including straight lines, planes, conic sections (circle, parabola, ellipse, hyperbola), and three-dimensional objects like sphere, cone, and cylinder.	PO1(3), PO2(1), PO3(1), PO4(1), PO5(2), PO8(2), PO9(1), PO10(1), PO11(2), PO15(2)
CO2	Explain the properties and standard equations of lines, planes, and conic sections, including their geometric interpretations and relationships in two and three dimensions.	PO1(3), PO2(2), PO3(2), PO4(2), PO5(2), PO7(1), PO8(2), PO9(2), PO10(1), PO11(2), PO15(2)
CO3	Apply coordinate geometry techniques to solve problems involving straight lines, pair of lines, planes, spheres, and conic sections using algebraic methods.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(2), PO9(2), PO10(2), PO11(2), PO15(2)
CO4	Analyze geometric structures by studying intersections, tangents, normal, and relative positions of lines, planes, and conics in two and three dimensions.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(2), PO9(2), PO10(2), PO11(2), PO15(2)
CO5	Evaluate and justify solutions to complex geometrical problems by selecting appropriate coordinate methods and interpreting results in geometric and real-world contexts.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(2), PO9(2), PO10(2), PO11(3), PO13(1), PO14(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	2	–	–	2	1	1	2	–	–	–	2		
CO2	3	2	2	2	2	–	1	2	2	1	2	–	–	–	2		
CO3	3	2	3	3	3	1	1	2	2	2	2	–	–	–	2		
CO4	3	2	3	3	3	2	1	2	2	2	2	–	–	–	2		
CO5	3	2	3	3	3	2	1	2	2	2	3	–	1	1	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Circle - *Common tangents to two circles (self-study).* **Text book 1: Chapter 4: Sections: 4.10 – 4.14.** Parabola **Text book 1: Chapter 6: Sections: 6.5-6.7.** Ellipse **Text book 1: Chapter 7: Sections: 7.6-7.8.** Hyperbola - *Some properties of the asymptotes (self-study).* **Text book 1: Chapter 8: Sections: 8.4-8.6.**	18
Unit II	Polar Equations **Text book 1: Chapter 9: Sections: 9.1 – 9.15.**	18
Unit III	Sphere **Text book 2: Chapter 4: Sections: 4.1- 4.8.**	18
Unit IV	Cone, Cylinder and Central quadrics **Text book 2: Chapter 5: Sections: 5.1 – 5.10.**	18
Unit V	Cone, Cylinder and Central quadrics **Text book 2: Chapter 5: Sections: 5.11 – 5.18**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

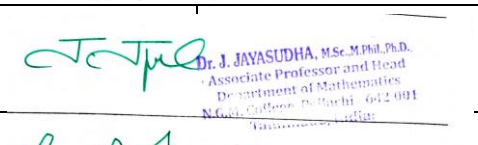
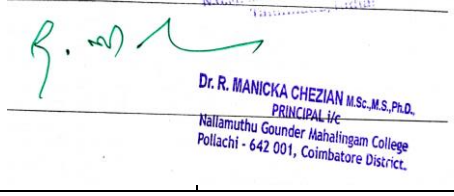
1. ManicavachagomPillai T. K, Natarajan T, *A text book of Analytical Geometry part-I two dimensions*, S. Viswanathan printers & publishers Pvt. Ltd, 2018.
2. ManicavachagomPillai T. K, Natarajan T, *A text book of Analytical Geometry part-I three dimensions*, S. Viswanathan printers & publishers, Pvt. Ltd, 2019.

Books for Reference:

1. Duraipandian P., Laxmi Duraipandian, Muhilan D, *Analytical Geometry 2 dimensional*, Emerald publishers, 2000.
2. Duraipandian P., LaxmiDuraipandian, Muhilan D, *Analytical Geometry 3 dimensional*, Emerald publishers, 2000.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=TpTA-xW2oq4
2. https://www.youtube.com/watch?v=cStx9_eWD5Y
3. https://www.youtube.com/watch?v=a2mt2L0e06Y

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS2A2	Title	Batch:	2026 - 2029
		MATHEMATICAL STATISTICS – II	Semester:	II
Lecture Hrs./Week or Practical Hrs./Week	6		Credits:	5

Course Objective

The objective of this paper is to introduce the concepts about correlation, regression, sample theory, sampling distributions and theory of estimation.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall definitions and basic concepts of correlation, regression, large sample theory, Chi-square, t/F/z distributions, and estimation methods.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain the meaning, properties, and interpretation of correlation coefficients, regression coefficients, sampling distributions, and statistical tests.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Apply statistical formulas and tests to compute correlation, regression coefficients, significance tests, Chi-square tests, and estimators for real data.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze sample data using large sample methods, regression analysis, and statistical tests to draw inferences about populations.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate statistical results, check assumptions of tests, compare estimators, and interpret outcomes for decision-making in practical problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Correlation:** Introduction – Meaning of correlation – Scatter diagram - Karl Pearson's coefficient of Correlation - Limits for Correlation Coefficient - Calculation of the Correlation Coefficient for a Bivariate Frequency Distribution - Rank Correlation - Spearmen's Rank Correlation Coefficient - problems only (no derivations). **Chapter 10: Sections: 10.1, 10.2, 10.3, 10.4, 10.4.1, 10.5, 10.7, 10.7.1.** **Linear Regression:** Introduction – Linear Regression - Regression Coefficients – Properties of Regression Coefficients- *Angle between two Lines of Regression (Self study)* – Simple Problems. **Chapter 11: Sections: 11.1, 11.2, 11.2.1, 11.2.2, 11.2.3.**	18
Unit II	**Large Sample Theory:** Introduction – Types of sampling – Purposive sampling –Random Sampling – simple sampling – Stratified sampling - Parameter and Statistic – Sampling Distribution of a Statistic - Standard Error - Tests of Significance - Null and alternative Hypothesis - Errors in sampling - Critical Region and Level of Significance - One-tailed and Two-tailed tests - Critical Values or Significant Values - Procedure for Testing of Hypothesis - Tests of Significance for Large Samples - Sampling of Attributes - Test of significance for Single Proportion - Test of significance for Difference of Proportions - Simple Problems. **Chapter 14 : Sections: 14.1, 14.2, 14.2.1, 14.2.2, 14.2.3, 14.2.4, 14.3, 14.3.1, 14.3.2, 14.4, 14.4.1-14.4.5, 14.5, 14.6, 14.7, 14.7.1, 14.7.2.**	18
Unit III	**Large Sample Theory:** Sampling of Variables - Test of significance for Single Mean – *Test of significance for Difference of Means (Self study)*- Simple Problems. **Chapter: 14 : Sections: 14.8, 14.8.3, 14.8.4.** **Chi – square (χ^2) Distribution:** Applications of Chi- square Distribution - Inferences about a Population Variance - Goodness of Fit Test - Test of Independence of Attributes-- Contingency Tables - Simple Problems. **Chapter 15: Sections: 15.6, 15.6.1, 15.6.2, 15.6.3.**	18
Unit IV	**t, F and z Distributions:** Applications of t-Distribution - t-test for Single Mean - t-test for Difference of Means - t-test for Testing the Significance of an Observed Sample Correlation Coefficient - Applications of F-Distribution - F-test for Equality of Two Population Variances - Simple Problems. **Chapter 16: Sections: 16.3, 16.3.1, 16.3.2, 16.3.4, 16.6, 16.6.1.**	18
Unit V	**Theory of Estimation:** Introduction - Characteristic of estimators – Unbiasedness –Consistency – Efficient estimators – Sufficiency – Cramer-Rao inequality – Simple problems – Methods of estimation – Method of maximum likelihood estimation – Properties of maximum Likelihood Estimators – Method of moments - Simple Problems. **Chapter 17: Sections: 17.1, 17.2, 17.2.1, 17.2.2, 17.2.3, 17.2.4, 17.3, 17.6, 17.6.1, 17.6.3.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Gupta S. C and Kapoor V. K., Fundamentals of Mathematical Statistics, Eleventh edition, S. Chand & Sons, New Delhi,2009.

Books for Reference:

1. Hogg R. V and Craigh A. G., Introduction to Mathematical Statistics, Pearson Education publications, 2004.
2. Veerarajan T., Fundamentals of Mathematical Statistics, Yes Dee PublishingPvt.Ltd., 2017.
3. Vital P. R., *Mathematical Statistics*,Margham publications, 2004.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. **Normal distribution**

   https://www.r-tutor.com/elementary-statistics/probability-distributions/normal-distribution

2. **Chi-squared Distribution**
   https://www.r-tutor.com/elementary-statistics/probability-distributions/chi-squared-distribution

3. **Student t Distribution**
   https://www.r-tutor.com/elementary-statistics/probability-distributions/student-t-distribution
4. **F Distribution**
   https://www.r-tutor.com/elementary-statistics/probability-distributions/f-distribution

5. http://www.khanacademy.com
6. https://nptel.ac.in/courses/111/105/111105124/
7. https://nptel.ac.in/courses/111/105/111105090/

Course Designed by	Dr. M. MAHESWARI	M.Malleli
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UCY	ProgrammeTitle :	B.Sc.Chemistry	
Course Code:	26UCY2A2	Title	Batch :	2026 - 2029
		MATHEMATICS FOR CHEMISTRY-II	Semester	II
Hrs/Week	5		Credits :	4

Course Objective

This paper enables the students to acquire the ability in solving problems in hyperbolic functions, Laplace and Inverse Laplace transforms and vector calculus.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Understand and apply the relationships between circular and hyperbolic functions, and solve problems using addition formulas of hyperbolic functions.	PO1(3), PO2(1), PO3(2), PO4(2), PO5(2), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO2	Compute Laplace transforms of elementary functions and apply properties such as linearity, shifting, scaling, and derivatives/integrals to solve problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO3	Determine inverse Laplace transforms using standard methods and properties, and apply them to solve ordinary differential equations.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO4	Apply vector differentiation concepts including gradient, divergence, and curl, and verify vector identities in solving physical and geometrical problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate vector integrals such as line, surface, and volume integrals, and apply Gauss Divergence Theorem and Green's Theorem to solve problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	2	2	–	–	2	1	1	1	–	–	–	2		
CO2	3	1	3	3	3	–	–	2	1	1	1	–	–	–	2		
CO3	3	1	3	3	3	3	–	2	1	1	1	–	–	–	2		
CO4	3	1	3	3	3	2	1	3	1	1	1	–	–	–	2		
CO5	3	1	3	3	3	1	1	3	1	2	1	–	–	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Hyperbolic functions**: Relations between circular and hyperbolic functions - Addition formula for hyperbolic functions - Problems. **Chapter 14: Sections: 1-9** **(Pg. No. : 14.31 to14.37 and 14.40 to 14.55)** **Laplace Transform**: Definition - Laplace transform of elementary function - Linear Property – Shifting Property - Change of scale property - Laplace transform of derivatives - Laplace transform of integrals - Multiplication by t - problems. **Chapter 27: Sections:1,2** **(Pg. No. : 27.1 to 27.20)**	15
Unit II	**Inverse Laplace Transform**: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems. **Chapter 27: Sections:4, 5** **(Pg. No. : 27.23 to 27.62)**	15
Unit III	**Vector Differentiation**: Gradient, Curl and Divergence – Problems-Divergence and Curl of a Vector point function-Problems-Vector Identities-Problems. **Chapter 28** **(Pg. No.: 6 to 53)**	15
Unit IV	**Vector Integration:** Line Integral - Surface Integral - Volume Integral - Simple Problems. **Chapter 29** **(Pg. No. : 59 to 88)**	15
Unit V	**Vector Integration:** Gauss Divergence Theorem(without proof) -Green's theorem (without proof) - Simple Problems. **Chapter 29** **(Pg. No.: 94 to 107 and 129 to 141)**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Vittal P. R,*Allied Mathematics,* Fourth Edition, Margham Publications, Chennai, 2010.

Books for Reference:

1. Murray R. Spiegel, *Shaum's outline of theory and problem of vector analysis*
2. Murray R. Spiegel, *Shaum's outline of theory and problem of Laplace Transform.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=Pq-tUQzeSRw
2. https://www.youtube.com/watch?v=M0H1UJbn-V4

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UCY	**Programme Title:**	B.Sc.Chemistry	
Course Code:	26UCY2A3	**Title**	**Batch:**	2026 - 2029
		Programming Lab for Chemistry using MATLAB	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

This course ensures a practical knowledge for computing the sub matrices from the existing matrix and finding the derivative of polynomials.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall basic concepts of matrices, vectors, algebraic expressions, derivatives, and fundamental programming constructs used for mathematical computations.	PO1(2), PO3(1), PO5(1), PO8(1), PO10(2), PO11(1), PO15(1)
CO2	Explain the procedures for matrix operations, polynomial evaluation, logical operations, and basic mathematical problem-solving using programming.	PO1(2), PO2(1), PO3(2), PO4(1), PO5(2), PO8(2), PO10(2), PO11(1), PO15(1)
CO3	Apply programming techniques to perform matrix operations, solve systems of equations, evaluate polynomials, and compute derivatives and integrals.	PO1(3), PO3(3), PO4(3), PO5(2), PO8(3), PO10(3), PO11(2), PO15(2)
CO4	Analyze problems involving matrices, vectors, temperature data, and algebraic computations, and implement appropriate logic using programming constructs.	PO1(3), PO3(3), PO4(3), PO5(2), PO6(1), PO8(3), PO10(3), PO11(2), PO15(2)
CO5	Evaluate and develop efficient programs to solve real-life and mathematical problems such as wage calculation, data analysis, and verification of mathematical properties.	PO1(2), PO3(1), PO5(1), PO8(1), PO10(2), PO11(1), PO15(1)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	–	1	–	1	–	–	1	–	2	1	–	–	–	1		
CO2	2	1	2	1	2	–	–	2	–	2	1	–	–	–	1		
CO3	3	–	3	3	2	–	–	3	–	3	2	–	–	–	2		
CO4	3	–	3	3	2	1	–	3	–	3	2	–	–	–	2		
CO5	2	–	1	–	1	–	–	1	–	2	1	–	–	–	1		

3 Point Scale – 1, 2, 3

List of programs:

1. Program for creating a matrix 5×4
2. Program for finding the characteristic equation of the 3×3 matrix
3. Program to illustrate the row vector problem in a given matrix $\begin{bmatrix} 6 & 43 & 2 & 11 & 87 \\ 12 & 6 & 34 & 0 & 5 \\ 34 & 18 & 7 & 41 & 9 \\ 2 & 4 & 6 & 8 & 10 \end{bmatrix}$
4. Program to illustrate the column vector problem in a given matrix $\begin{bmatrix} 3 & 6 & 9 & 12 & 15 \\ 7 & 14 & 21 & 28 & 35 \end{bmatrix}$
5. Program to illustrate the creation of sub matrix from a given 4×7 matrix
6. Program to finding the eigen values of the 3×3 matrix
7. Program to check the matrix 3×3 is symmetric or skew symmetric
8. Program to solve the system of linear equations $\begin{matrix} 4x - 2y + 6z = 8 \\ 2x + 8y + 2z = 4 \\ 6x + 10y + 3z = 0 \end{matrix}$

9. Program to create a 6×6 matrix in which the middle rows and the middle two columns are 1's and the rest are zeros.
10. The following were the daily maximum temperature (in °F) in Washington In during the month of April, 2002: 58 73 73 53 50 48 56 73 66 69 63 74 82 91 93 89 91 80 59 69 56 64 63 66 64 74 63 69, (data from the U.S. National Organic and Atmospheric Administrations). Use relational and logical operations determine the following:
    A) The number of days the temperature was above 75°
    B) The number of days the temperature was between 65° and 80°
    C) The days of the month that the temperature was between 50° and 60°
11. A worker is paid according to his hourly wage up to 40 hours, and 50% more for overtime. Write a program in a script file that calculates the pay to a worker. The programs ask the user to enter the number of hours and the hourly wage. The program the displays the pay.
12. A vector is given by V=[5,17,-3,8,0,-1,12,15,20,-6,6,4,-7,16]. Write a program as a script file that doubles the elements that are positive and are divisible by 3 and/or 5, and raise to the power of 3 the elements that are negative but greater than -5.
13. For the polynomial $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
    A) Calculate $f(9)$
    B) Calculate $f(x)$ for $0 <= x <= 10$
14. Create 3×3 matrix to demonstrate that matrix multiplication is not commutative.
15. Program to find the first and second derivative of $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
16. Program to find the first and second derivative of $f(x) = e^{3x+2}$ and find $\int_0^{\frac{\pi}{2}} \sin(2x)\, dx$
17. Program to find the inverse of a matrix.
18. Program to find the element by element operations.
19. Program in a script file that determines the real roots of a quadratic equation
$$ax^2 + bx + c = 0.$$

20. The maximum daily temperatures (in ^{0}F) for New York city and Anchorage Alaska during the month of January 2001 are given in the vectors below (data from the U.S. National Oceanic Atmospheric Administration). TNY=[31 26 30 33 33 39 41 41 34 33 45 42 36 39 37 45 43 36 41 37 32 32 35 42 38 33 40 37 36 51 50]
TANC=[37 24 28 25 21 28 46 37 36 20 24 31 34 40 43 36 34 41 42 35 38 36 35 33 42 42 37 26 20 25 31].Write a Program in a script file to answer the following:
a) Calculate the average temperature for the month in each city.

b) How many days was the temperature below the average in each city.
c) How many days, and which dates in the month, was the temperature the same in both cities?
d) How many days, and which dates in the month, was the temperature in both cities above freezing(above 32^0F)

21. Program for divide the polynomial $15x^5 + 35x^4 - 37x^3 - 19x^2 + 41x - 15$ by polynomial $5x^3 - 4x + 3$

Text Book:

Amos Gilat, *MATLAB - An Introduction with Application*, John Wiley & Sons, Singapore, Third Edition, 2007.

Books for Reference:

1. Etter D. M., Kuncicky D. C. and Moore H., Introduction to MATLAB 7, Prentice Hall, New Jersy, 2009.
2. Palm W. J., Introduction to MATLAB 7 for Engineers, McGraw-Hill Education, New York, 2005.
3. Prata R. P., Getting Started with MATLAB - A Quick Introduction for Scientist and Engineers, Oxford University Press, New Delhi, 2010.

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UPS	**ProgrammeTitle :**	B.Sc.Physics	
Course Code:	26UPS2A2	**Title**	**Batch :**	2026 - 2029
		MATHEMATICS FOR PHYSICS-II	**Semester**	II
Hrs/Week	5		**Credits :**	4

Course Objective

This paper enables the students to acquire the ability in solving problems in hyperbolic functions, Laplace and Inverse Laplace transforms and vector calculus.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Understand and apply relationships between circular and hyperbolic functions, and solve problems using addition formulas of hyperbolic functions.	PO1(3), PO2(1), PO3(2), PO4(2), PO5(2), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO2	Compute Laplace transforms of elementary functions and apply various properties such as linearity, shifting, scaling, and operations involving derivatives and integrals.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO3	Determine inverse Laplace transforms and use them to solve ordinary differential equations.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO4	Apply vector differentiation concepts such as gradient, divergence, and curl, and verify vector identities in problem-solving.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate line, surface, and volume integrals and apply Gauss Divergence Theorem, Stokes' Theorem, and Green's Theorem to solve problems in vector calculus.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	2	2	–	–	2	1	1	1	–	–	–	2		
CO2	3	1	3	3	3	–	–	2	1	1	1	–	–	–	2		
CO3	3	1	3	3	3	1	–	2	1	1	1	–	–	–	2		
CO4	3	1	3	3	3	2	1	3	1	1	1	–	–	–	2		
CO5	3	1	3	3	3	1	1	3	1	2	1	–	–	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Hyperbolic functions**: Relations between circular and hyperbolic functions - Addition formula for hyperbolic functions - Problems. **Chapter 14: Sections: 1-9** **(Pg. No. : 14.31 to14.37 and 14.40 to 14.55)** **Laplace Transform**: Definition - Laplace transform of elementary function - Linear Property – Shifting Property - Change of scale property - Laplace transform of derivatives - Laplace transform of integrals - Multiplication by t - problems. **Chapter 27: Sections:1,2** **(Pg. No. : 27.1 to 27.20)**	15
Unit II	**Inverse Laplace Transform**: Inverse Laplace Transform of some functions-Properties of Inverse Laplace Transform-Problems-Solving Differential Equations using Laplace Transform-Problems. **Chapter 27: Sections:4, 5** **(Pg. No. : 27.23 to 27.62)**	15
Unit III	**Vector Differentiation**: Gradient, Curl and Divergence – Problems-Divergence and Curl of a Vector point function-Problems-Vector Identities-Problems. **Chapter 28** **(Pg. No.: 6 to 53)**	15
Unit IV	**Vector Integration:** Line Integral - Surface Integral - Volume Integral - Simple Problems. **Chapter 29** **(Pg. No. : 59 to 88)**	15
Unit V	**Vector Integration:** Gauss Divergence Theorem(without proof) -Stoke's Theorem(without proof) -Green's theorem (without proof) - Simple Problems. **Chapter 29** **(Pg. No.: 94 to 141)**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

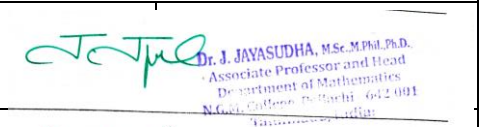
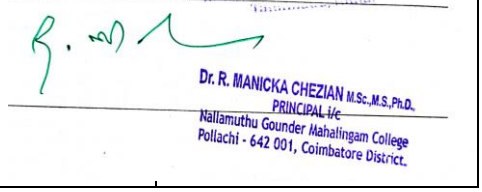
Vittal P. R, *Allied Mathematics,* Fourth Edition, Margham Publications, Chennai, 2010.

Books for Reference:

1. Murray R. Spiegel, *Shaum's outline of theory and problem of vector analysis.*
2. Murray R. Spiegel, *Shaum's outline of theory and problem of Laplace transform.*

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.youtube.com/watch?v=Pq-tUQzeSRw
2. https://www.youtube.com/watch?v=M0H1UJbn-V4

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UPS	**Programme Title:**	B.Sc.Physics	
Course Code:	26UPS2A3	**Title**	**Batch:**	2026 - 2029
		Programming Lab for Physics using MATLAB	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	2

Course Objective

This course ensures a practical knowledge for computing the sub matrices from the existing matrix and finding the derivative of polynomials.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall basic concepts of matrices, vectors, algebraic expressions, derivatives, and fundamental programming constructs used for mathematical computations.	PO1(2), PO3(1), PO5(1), PO8(1), PO10(2), PO11(1), PO15(1)
CO2	Explain the procedures for matrix operations, polynomial evaluation, logical operations, and basic mathematical problem-solving using programming.	PO1(2), PO2(1), PO3(2), PO4(1), PO5(2), PO8(2), PO10(2), PO11(1), PO15(1)
CO3	Apply programming techniques to perform matrix operations, solve systems of equations, evaluate polynomials, and compute derivatives and integrals.	PO1(3), PO3(3), PO4(3), PO5(2), PO8(3), PO10(3), PO11(2), PO15(2)
CO4	Analyze problems involving matrices, vectors, temperature data, and algebraic computations, and implement appropriate logic using programming constructs.	PO1(3), PO3(3), PO4(3), PO5(2), PO6(1), PO8(3), PO10(3), PO11(2), PO15(2)
CO5	Evaluate and develop efficient programs to solve real-life and mathematical problems such as wage calculation, data analysis, and verification of mathematical properties.	PO1(2), PO3(1), PO5(1), PO8(1), PO10(2), PO11(1), PO15(1)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	–	1	–	1	–	–	1	–	2	1	–	–	–	1		
CO2	2	1	2	1	2	–	–	2	–	2	1	–	–	–	1		
CO3	3	–	3	3	2	–	–	3	–	3	2	–	–	–	2		
CO4	3	–	3	3	2	1	–	3	–	3	2	–	–	–	2		
CO5	2	–	1	–	1	–	–	1	–	2	1	–	–	–	1		

3 Point Scale – 1, 2, 3

List of programs:

1. Program for creating a matrix 5×4
2. Program for finding the characteristic equation of the 3×3 matrix
$$\begin{bmatrix} 6 & 43 & 2 \\ 11 & 87 & 34 \\ 18 & 7 & 41 \end{bmatrix}$$
3. Program to illustrate the row vector problem in a given matrix $\begin{bmatrix} 12 & 6 & 34 & 0 & 5 \\ 2 & 4 & 6 & 8 & 10 \end{bmatrix}$
4. Program to illustrate the column vector problem in a given matrix $\begin{bmatrix} 3 & 6 & 9 & 12 & 15 \\ 7 & 14 & 21 & 28 & 35 \end{bmatrix}$
5. Program to illustrate the creation of sub matrix from a given 4×7 matrix
6. Program to finding the eigen values of the 3×3 matrix
7. Program to check the matrix 3×3 is symmetric or skew symmetric
8. Program to solve the system of linear equations $\begin{matrix} 4x - 2y + 6z = 8 \\ 2x + 8y + 2z = 4 \\ 6x + 10y + 3z = 0 \end{matrix}$
9. Program to create a 6×6 matrix in which the middle rows and the middle two columns are 1's and the rest are zeros.
10. The following were the daily maximum temperature (in °F) in Washington In during the month of April, 2002: 58 73 73 53 50 48 56 73 66 69 63 74 82 91 93 89 91 80 59 69 56 64 63 66 64 74 63 69, (data from the U.S. National Organic and Atmospheric Administrations). Use relational and logical operations determine the following:
    A) The number of days the temperature was above 75°
    B) The number of days the temperature was between 65° and 80°
    C) The days of the month that the temperature was between 50° and 60°
11. A worker is paid according to his hourly wage up to 40 hours, and 50% more for overtime. Write a program in a script file that calculates the pay to a worker. The programs ask the user to enter the number of hours and the hourly wage. The program the displays the pay.
12. A vector is given by V=[5,17,-3,8,0,-1,12,15,20,-6,6,4,-7,16]. Write a program as a script file that doubles the elements that are positive and are divisible by 3 and/or 5, and raise to the power of 3 the elements that are negative but greater than -5.
13. For the polynomial $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$
    c) Calculate $f(9)$
    d) Calculate $f(x)$ for $0 <= x <= 10$
14. Create 3×3 matrix to demonstrate that matrix multiplication is not commutative.
15. Program to find the first and second derivative of $f(x) = x^5 - 12.1x^4 + 40.59x^3 - 17.015x^2 - 71.95x + 35.88$

16. Program to find the first and second derivative of $f(x) = e^{3x+2}$ and find $\int_0^{\frac{\pi}{2}} \sin(2x)\, dx$
17. Program to find the inverse of a matrix.
18. Program to find the element by element operations.
19. Program in a script file that determines the real roots of a quadratic equation

$$ax^2 + bx + c = 0.$$

20. The maximum daily temperatures (in ^{0}F) for New York City and Anchorage Alaska during the month of January 2001 are given in the vectors below (data from the U.S. National Oceanic Atmospheric Administration). TNY=[31 26 30 33 33 39 41 41 34 33 45 42 36 39 37 45 43 36 41 37 32 32 35 42 38 33 40 37 36 51 50]
TANC=[37 24 28 25 21 28 46 37 36 20 24 31 34 40 43 36 34 41 42 35 38 36 35 33 42 42 37 26 20 25 31].Write a Program in a script file to answer the following:
a) Calculate the average temperature for the month in each city.
b) How many days was the temperature below the average in each city.
c) How many days, and which dates in the month, was the temperature the same in both cities?
d) How many days, and which dates in the month, was the temperature in both cities above freezing(above 32^0F)

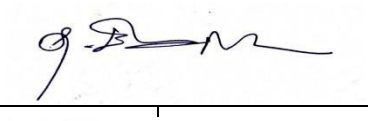
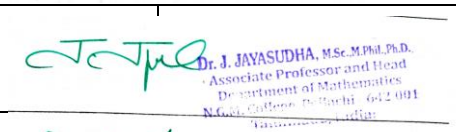
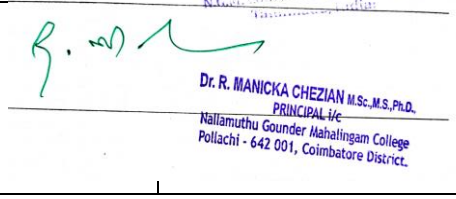
21. Program for divide the polynomial $15x^5 + 35x^4 - 37x^3 - 19x^2 + 41x - 15$ by polynomial $5x^3 - 4x + 3$

Text Book:

Amos Gilat, *MATLAB - An Introduction with Application*, John Wiley & Sons, Singapore, Third Edition, 2007.

Books for Reference:

1. Etter D. M., Kuncicky D. C. and Moore H., Introduction to MATLAB 7, Prentice Hall, New Jersy, 2009.
2. Palm W. J., Introduction to MATLAB 7 for Engineers, McGraw-Hill Education, New York, 2005.
3. Prata R. P., Getting Started with MATLAB - A Quick Introduction for Scientist and Engineers, Oxford University Press, New Delhi, 2010.

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS305	**Title**	**Batch:**	2026 - 2029
		STATICS	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This course enables a deep knowledge about the concept of Forces, Moments, Friction, Gravity and resultant of more than one force acting on a surface. It also includes simple problems in each topic which develops the application skills of the students in solving them.

Course Outcomes(CO)

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

CO Number	CO Statement	
CO1	Recall concepts of forces, parallel forces, moments, couples, friction, and centre of gravity	PO1(3), PO2(1), PO3(1), PO8(1), PO15(1)
CO2	Explain force systems (coplanar, parallel) and equilibrium of rigid bodies	PO1(3), PO2(2), PO3(2), PO4(1), PO5(1), PO8(2), PO15(1)
CO3	Apply principles to solve problems on forces, moments, couples, friction, and centre of gravity	PO1(3), PO2(1), PO3(2), PO4(3), PO5(2), PO6(1), PO8(2), PO10(1), PO11(1), PO15(1)
CO4	Analyze equilibrium of three forces and coplanar force systems	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(3), PO9(1), PO10(1), PO11(1), PO15(1)
CO5	Evaluate mechanical systems considering friction, equilibrium, and stability	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(1), PO11(1), PO13(1), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	-	-	-	-	1	-	-	-	-	-	-	1		
CO2	3	2	2	1	1	-	-	2	-	-	-	-	-	-	1		
CO3	3	1	2	3	2	1	-	2	-	1	1	-	-	-	1		
CO4	3	1	3	3	3	1	1	3	1	1	1	-	-	-	1		
CO5	3	2	3	3	3	2	1	3	1	1	1	-	1	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Forces acting at a point - Simple problems. **Chapter 2: Sections: 1-16.**	15
Unit II	Parallel forces -*Moments (Self study)* - Simple problems. **Chapter 3: Sections: 1 - 13.**	15
Unit III	Couples - Simple problems **Chapter 4: Sections: 1-10.**	15
Unit IV	Equilibrium of three forces acting on a rigid body - *Coplanar forces (Self study)* - Simple Problems. **Chapter 5: Sections: 1 - 6, Chapter 6: Sections: 1 - 13.**	15
Unit V	Friction and Centre of gravity – Simple problems. **Chapter 7: Sections: 1, 3-8, 10-12, Chapter 8: Sections : 1-6, 18.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Venkataraman M. K, *Statics*, Sixth Edition, Agasthiar publications, 2007.

Books for Reference:

1. Dharmapadam A. V, *Statics*,S. Viswanathan printers and Publishers Pvt. Ltd, 1993.
2. Duraipandian P and LaxmiDuraipandian, *Mechanics*, Ram Nagar, New Delhi, S. Chand & Co. Pvt. Ltd, 1985.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

https://nptel.ac.in/courses/112/106/112106180/

Course Designed by	Dr. M. AMSAVENI	HOD
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS306	**Title**	**Batch:**	2026 - 2029
		DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

The course aims to build fundamental knowledge of ordinary and partial differential equations and their solution methods. It develops problem-solving skills using analytical techniques like variation of parameters and power series methods. It also enables students to model and solve real-world problems using differential equations.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the basic concepts and standard forms of ordinary and partial differential equations, including first-order equations, higher-degree equations, and power series methods.	PO1(3), PO2(1), PO3(1), PO4(1), PO8(1), PO11(1), PO15(1)
CO2	Understand the methods of solving differential equations such as linear equations, Bernoulli's equations, Clairaut's equations, and Lagrange's linear equations.	PO1(3), PO3(2), PO4(2), PO5(2), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Apply appropriate techniques such as variation of parameters, total differential equations, and power series (including Frobenius method) to solve ordinary differential equations.	PO1(3), PO3(2), PO4(3), PO5(3), PO6(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze partial differential equations by forming equations, identifying standard types, and obtaining complete, singular, and general solutions using suitable methods.	PO1(3), PO3(3), PO4(2), PO5(3), PO6(2), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate and solve higher-order and non-homogeneous partial differential equations using methods such as Charpit's method and Lagrange's method for practical applications.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(2), PO11(2), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	–	–	–	1	–	–	1	–	–	–	1		
CO2	3	–	2	2	2	–	–	2	–	1	1	–	–	–	1		
CO3	3	–	2	3	3	1	–	2	–	1	1	–	–	–	2		
CO4	3	–	3	2	3	2	–	3	1	2	1	–	–	–	2		
CO5	3	–	3	3	3	2	1	3	2	2	2	–	–	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**First order and first degree equations of Bernoulli :** Linear equations - Bernoulli's equations– problems. **Differential Equations of first order and higher degree:** Equations solvable for p – Equations solvable for y – Equations solvable for x – Clairaut's equation – problems. **Text Book 1: Chapter 1(A), 1(B).**	15
Unit II	**Linear Homogeneous equation and variation of parameter:** Lagrange's linear equation - variation of parameters – problems. **Total differential equations:** Procedure for solving Total differential equations in three variables $Pdx + Qdy + Rdz = 0$ – problems. **Text Book 1: Chapter 3, Chapter 4.**	15
Unit III	**Solutions of differential equations by power series method:** Power series – Frobenius Method. **Text Book 1: Chapter 9: Sections: 1-3.**	15
Unit IV	**Partial differential equations:** Formation of Partial differential equations by eliminating arbitrary constants and arbitrary functions – Non-linear differential equations of first order-standard types –Complete solution - Singular and general solution – Solutions of the Partial Differential Equations of Standard type I, II, III, IV. **Text Book 1: Chapter 5: Section 1-7.**	15
Unit V	Charpit's method - Lagrange's linear partial differential equation – Problems. **Partial Differential Equation:** Partial Differential Equation of higher order – Homogeneous linear equation – Non- homogeneous linear equation. **Text Book 1: Chapter 5,** **Text Book 2: Chapter 2: Section 2.17 - 2.22**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

1. P.R. Vittal, Differential Equations, Fourier and Laplace Transforms, Probability – Year of Publication 2000, Margham Publications, 24, Rameshwaram Road, T.Nagar, Chennai – 600017.

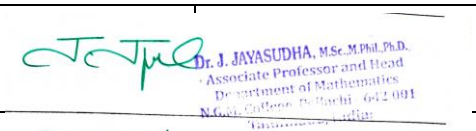
2. Kandasamy, Gunavathi & Thilagavathy – Engineering Mathematics – III, Year of Publication 1996,Emerald Publishers. 135, Anna Salai, Chennai – 600 002.

Reference Books

1. G.F. Simmons, Differential equations with applications and historical notes, 2ndEd, Tata Mcgraw Hill Publications, 1991.
2. D.A. Murray, Introductory course in Differential Equations, Orient and Longman
3. H.T. H.Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985.
4. Sundrapandian, V. Ordinary and Partial Differential Equations, Tata McGraw Hill Education Pvt.Ltd. New Delhi, 2013
5. T. Veerarajan, Differential equations and Laplace transforms, Yes Dee Publishing Pvt Ltd. Chennai, 2020.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

https://nptel.ac.in/courses/111106100

Course Designed by	Dr. A. GNANASOUNDARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS3N1	**Title**	**Batch:**	2026 - 2029
		Non Major Elective I:QUANTITATIVE APTITUDE – I	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	1		**Credits:**	1

Course Objective

The objective of this syllabus is to make the students to clear competitive examination like Banking recruitment, Postal recruitment, Railway recruitment and TNPSC exams.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall basic concepts, definitions, and important facts related to percentage, ratio, profit and loss, permutations & combinations, and probability**.**	PO1(3), PO2(1), PO3(1), PO5(1), PO8(1), PO15(1)
CO2	Understand the concepts of percentage, BODMAS rule, ratio and proportion, and probability**,** and interpret their applications in simple contexts.	PO1(3), PO2(1), PO3(2), PO4(1), PO5(2), PO8(2), PO11(1), PO15(1)
CO3	Apply mathematical techniques to solve problems involving simplification (BODMAS), percentage, ratio and proportion, and profit and loss**.**	PO1(3), PO2(1), PO3(3), PO4(3), PO5(2), PO6(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze problems related to profit and loss, permutations and combinations, and probability, and identify appropriate methods for solution.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO8(2), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate and solve complex problems by selecting suitable strategies in permutations & combinations and probability, and verify the correctness of results.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(3), PO9(1), PO10(1), PO11(2), PO13(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	1	–	–	–	–	–	–	1		
CO2	3	1	2	1	2	–	–	2	–	–	1	–	–	–	1		
CO3	3	1	3	3	2	1	–	2	–	1	1	–	–	–	2		
CO4	3	1	3	3	3	1	–	2	1	1	1	–	–	–	2		
CO5	3	2	3	3	3	1	1	3	1	1	2	–	1	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Percentage:** Introduction - Important facts and family - Concept of percentage - Simple problems. **Chapter 10** **Simplification:** Introduction - BODMAS rule - Simple problems. **Chapter 4**	3
Unit II	**Ratio and Proportion**: Ratio - Proportion - Simple problems. **Chapter 12:**	3
Unit III	**Profit and loss**: Introduction - Cost price - Selling price - Profit and loss - Simple Problems. **Chapter 11**	3
Unit IV	**Permutations and Combinations:** Factorial Notation – Permutations – Combinations. **Chapter 30**	3
Unit V	**Probability:** Sample Space – Results on probability. **Chapter 34**	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

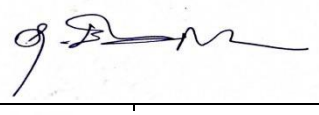
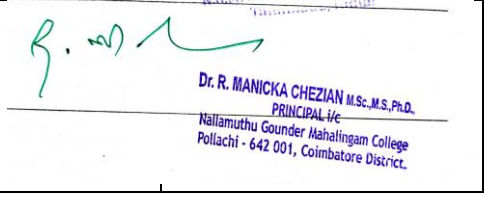
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Aggarwal R. S, *Quantitative Aptitude,* S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/2_XXuqkJFgs
2. https://youtu.be/g_Fahsgyn-Q

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS3N2	**Title**	**Batch:**	2026 - 2029
		Non Major Elective I: ASTRONOMY- I	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	1		**Credits:**	1

Course Objective

This paper enables the learners to gain basic knowledge of the Solar System and the Milky Way.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	
CO1	Recall fundamental concepts, definitions, and key features related to the Solar System, planets, comets, meteors, stars, constellations, and the Milky Way.	PO1(3), PO2(1), PO3(1), PO5(1), PO8(2), PO15(1)
CO2	Understand the structure and components of the Solar System, types of stars and stellar phenomena, and the concept of constellations and seasonal changes in the night sky.	PO1(3), PO2(2), PO3(2), PO4(1), PO5(2), PO8(3), PO10(1), PO11(1), PO15(1)
CO3	Apply knowledge to identify planets, constellations, and celestial objects and interpret their positions and movements in the sky.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(2), PO6(1), PO8(3), PO10(1), PO11(1), PO15(2)
CO4	Analyze different types of stars (variable stars, novae), star clusters, nebulae, and distinguish between various constellations and their seasonal visibility.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO8(3), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate astronomical phenomena and relationships within the Solar System and Milky Way, and interpret observational data related to stars and constellations.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(1), PO11(2), PO13(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	2	–	–	–	–	–	–	1		
CO2	3	2	2	1	2	–	–	3	–	1	1	–	–	–	1		
CO3	3	2	3	2	2	1	–	3	–	1	1	–	–	–	2		
CO4	3	2	3	3	3	1	–	3	1	1	1	–	–	–	2		
CO5	3	2	3	3	3	2	1	3	1	1	2	–	1	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**The Solar System**: Introduction - The Sun - Mercury - Venus - Mars - Asteroids - Jupiter - Saturn - Uranus - Neptune. **Chapter 16: Sections: 316 - 326.Pg.No : 455 – 467**	3
Unit II	**The Solar System**: Comets - Meteors - Zodiacal light. **Chapter 16 Sections: 327 - 329.Pg.No : 467 – 472**	3
Unit III	**Double And Multiple Stars**: Introduction - Variables stars - Eclipsing Variables Cepheid variables - Long period variables - Irregular variables - Novae - Star clusters Nebulae - Constellations - Zodiacal Constellations. **Chapter 17: Sections: 339 - 345.Pg.No : 481 -489**	3
Unit IV	**The Milky Way**: Introduction - Seasonal changes in the night sky - The winter Constellations - The spring Constellations. **Chapter 17: Sections: 346 - 347.Pg.No : 489 – 497**	3
Unit V	**Constellations**: Introduction - The summer Constellations - The autumn Constellations. **Chapter 17: Section: 347.Pg.No : 497 – 504**	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

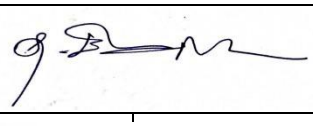
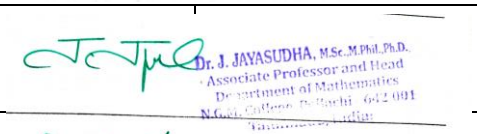
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kumaravelu S and SusheelaKumaravelu, *Astronomy for degree classes*, 7th edition 1986.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/libKVRa01L8
2. **https://youtu.be/pIFiCLhJmig**

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

VALUE ADDED COURSE-I

Programme Code:	UMS			**Programme Title:**	B. Sc. Mathematics	
Course Code:	26UMS3VA			**Title**	**Batch:**	2026-2029
				INTERNET OF THINGS	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	-	**Tutorial Hrs./Sem.**	30		**Credits:**	2*

Course Objectives

This course highlights on physical design, logical design, enabling technologies of IoT, IoT system management and design methodology.

Course outcomes (CO)

At the end of this course, the students will be able to

CO Number	CO Statement	
CO1	Recall the fundamental concepts of IoT, including definitions, characteristics, physical design, and basic protocols.	PO1(3), PO2(1), PO3(1), PO4(1), PO8(1), PO11(1), PO15(1)
CO2	Understand the logical design of IoT, functional blocks, communication models, enabling technologies such as wireless sensor networks, cloud computing, and embedded systems.	PO1(3), PO3(2), PO4(2), PO5(2), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Apply IoT levels and deployment templates to design simple IoT systems and analyze case studies such as weather monitoring systems.	PO1(3), PO3(2), PO4(3), PO5(3), PO6(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze IoT platform design methodology including domain, information, service, and functional specifications for building IoT applications.	PO1(3), PO3(3), PO4(2), PO5(3), PO6(2), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate IoT devices and interfaces, including Raspberry Pi, and integrate hardware and software components for developing real-time IoT applications.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(2), PO11(2), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	–	–	–	1	–	–	1	–	–	–	1		
CO2	3	–	2	2	2	–	–	2	–	1	1	–	–	–	1		
CO3	3	–	2	3	3	1	–	2	–	1	1	–	–	–	2		
CO4	3	–	3	2	3	2	–	3	1	2	1	–	–	–	2		
CO5	3	–	3	3	3	2	1	3	2	2	2	–	–	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Introduction to Internet of Things: Introduction – Definition and Characteristics of IoT – Physical design of IoT – Things in IoT - IoT Protocols.	6
Unit II	Logical Design of IoT – IoT Functional Blocks – IoT communication Models – IoT Communication APIs – IoT Enabling Technologies – Wireless Sensor Networks – Cloud Computing –Big Data Analytics – Communication Protocols – Embedded Systems.	6
Unit III	IoT Levels and Deployment Templates: IoT Level 1 - IoT Level 2 - IoT Level 3 - IoT Level 4 - IoT Level 5 - IoT Level 6 – Case Study on IoT System for Weather Monitoring.	6
Unit IV	IoT Platform Design Methodology: Purpose and Requirement Specification – Process Specification – Domain Model Specification – Information Model Specification – Service Specification – IoT Level Specification – Functional View Specification – Operational View Specification – Device and Component integration – Application Development.	6
Unit V	IoT physical devices and End Points – IoT Devices – Exemplanary Device: Raspberry Pi – About Board – Linux on Raspberry Pi – Raspberry Pi interfaces – Serial – SPI – I2C.	6
	Total Contact Hrs.	**30**

Text Book:

Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands on Approach, Orient Blakswan Provate Limited, 2014 , Ist Edition

Course Designed by	Profenaa Industrial Training Center		
Verified by HoD	Dr. J. JAYASUDHA		
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN		

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS407	**Title**	**Batch:**	2026 - 2029
		DYNAMICS	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	4

Course Objective

This course provides a thorough knowledge about the characteristics of Projectiles, Energies during impact and Collision. Each topic involves problems to solve which develops the application skills and thinking process of the students.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Identify and list the basic concepts, laws, and equations related to projectiles, simple harmonic motion, central forces, impulsive forces, and elastic collisions**.**	PO1(3), PO8(1), PO10(1), PO15(1)
CO2	Describe and illustrate the behavior of particles in projectile motion, SHM, and motion under central forces, including key characteristics like velocity, acceleration, and time period.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(1), PO8(2), PO10(1), PO15(1)
CO3	Solve numerical problems involving projectiles, SHM, impulsive forces, and elastic collisions using standard analytical methods.	PO1(3), PO3(2), PO4(3), PO5(3), PO8(2), PO10(1), PO15(2)
CO4	Examine and differentiate various physical situations involving central force motion, impulsive forces, and collisions, and analyze their outcomes.	PO1(3), PO3(3), PO4(2), PO5(3), PO6(3), PO8(3), PO9(1), PO10(2), PO15(2)
CO5	Evaluate the results of mechanical systems by verifying conditions such as maximum range, energy loss, and motion behavior.	PO1(3), PO2(1), PO3(3), PO4(2), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO12(1), PO13(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	1	-	1	–	–	–	–	1		
CO2	3	2	3	3	1	-	-	2	-	1	–	–	–	–	1		
CO3	3	-	2	3	3	-	-	2	-	1	–	–	–	–	2		
CO4	3	-	3	2	3	3	-	3	1	2	–	–	–	–	2		
CO5	3	1	3	2	3	2	-	3	2	3	–	1	1	–	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Projectiles**: Introduction – Definitions – Two fundamental principles – To show that the path of a projectile is a parabola – Characteristic of the motion of a projectile – A particle is projected horizontally from a point at a certain height above the ground: to show that the path described by it is a parabola – To determine when the horizontal range of a projectile is maximum, given the magnitude u of the velocity of projection – To show that, for a given initial velocity of projection there are, in general two possible directions of projections so as to obtain a given horizontal range – Range on an inclined plane – To find the greatest distance of the projectile from the inclined plane and show that is attained in half the total time of flight – To determine when the range on the inclined plane is maximum, given the magnitude u of the velocity of projection – To show that, for a given initial velocity of projection, there are, in general two possible directions of projections so as to obtain a given range on an inclined plane - Simple problems. **Chapter 6 :Sections : 6.1 - 6.8, 6.12 -6.15**	12
Unit II	**Simple Harmonic Motion:** Introduction – Simple harmonic motion in a straight line – General solution of the SHM equation – Geometrical representation of a SHM – Change of origin – Composition of two SHMs of the same period and in the same straight line - Composition of two SHMs of the same period in two perpendicular directions - Simple problems. **Chapter 10: Sections: 10.1 - 10.7.**	12
Unit III	**Motion under the action of central forces:** Introduction – Velocity and Acceleration in polar coordinates – Equations of motion in polar coordinates – Note on the equiangular spiral – Motion under a central force - *Differential Equations of central orbits (Self study)* – Perpendicular from the pole on the tangent, Formulae in polar coordinates – Pedal equation of the central orbit - Pedal equation of some of the well-known curves - Simple problems. **Chapter 11: Sections: 11.1 - 11.9.**	12
Unit IV	**Impulsive forces:** Impulse – Impulsive force – Impact of two bodies - Loss of kinetic energy in impact – Motion of a shot and gun – Impact of water on a surface - Simple problems. **Chapter 7: Sections: 7.1 - 7.6.**	12
Unit V	**Collision of elastic bodies:** Introduction – Definitions – Fundamental laws of impact - Impact of a smooth sphere on a fixed smooth plane -.Direct impact of two smooth spheres – Loss of kinetic energy due to direct impact of two smooth spheres – Oblique impact of two smooth spheres - Loss of kinetic energy due to Oblique impact of two smooth spheres - Simple problems. **Chapter 8: Sections: 8.1 - 8.8.**	12
	Total Contact Hrs.	**60**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

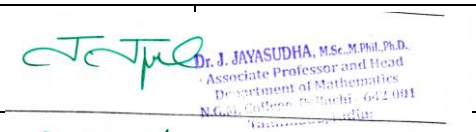
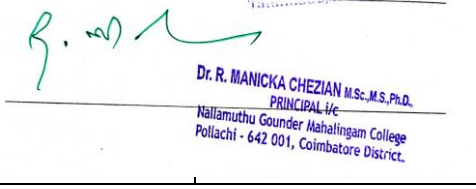
Venkataraman M. K, *Dynamics*, Thirteenth Edition, Agasthiar publications, Tiruchi, 2009.

Books for Reference:

1. Dharmapadam A. V, *Dynamics,* S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai, 1998.
2. Viswanath Naik K and Kasi M. S, *Dynamics*, Emerald Publishers, 1992.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/uM2HpLBVAkA
2. https://youtu.be/glsXr4SpOMQ
3. https://youtu.be/pZZt357pk-I

Course Designed by	Dr. A. GNANASOUNDARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS408	**Title**	**Batch:**	2026 - 2029
		PROGRAMMING IN 'C'	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	3		**Credits:**	3

Course Objective

C is a general- purpose structured programming language that is powerful, efficient and compact. The programming language C finds a wide variety of applications in the development of software. This course provides the students with all the fundamental concepts of the C language with some practical experience. Also helps the students to develop their programming skills and to build large programs.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the history, importance, and basic structure of C programs and identify elements such as character set, tokens, keywords, identifiers, constants, variables, and data types.	PO1(3), PO2(1), PO3(1), PO5(1), PO8(2), PO10(1), PO15(1)
CO2	Explain the different types of operators, expressions, operator precedence, type conversions, and input/output operations in C programming.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO15(1)
CO3	Apply decision-making statements and looping constructs such as if, if-else, switch, while, do-while, and for to develop simple C programs.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO7(1), PO8(2), PO9(1), PO10(2), PO11(1), PO15(1)
CO4	Analyze and develop programs using arrays, strings, and user-defined functions including recursion and multi-function programs.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(3), PO7(1), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate and implement advanced C programming concepts such as pointers and file handling operations including file input/output, error handling, and random file access.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(2), PO9(2), PO10(3), PO11(2), PO13(1), PO14(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	2	–	1	–	–	–	–	1		
CO2	3	1	3	3	2	–	–	2	–	2	–	–	–	–	1		
CO3	3	1	2	3	3	–	1	2	1	2	1	–	–	–	1		
CO4	3	1	3	3	3	3	1	3	1	2	1	–	–	–	2		
CO5	3	1	3	3	3	2	1	2	2	3	2	–	1	1	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Overview of C:** History of C - Importance of C - Basic Structure of C Programs **Constants ,Variables and Data Types:** Introduction - Character set - C Tokens - Keywords and identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining symbolic constants **Operators and Expressions:** Introduction -Arithmetic operators - Relational operators - Logical operators - Assignment operators - increment and Decrement operators - conditional operators- Bitwise operators- Special operators - Arithmetic expressions - Evaluation of expressions - *Precedence of arithmetic operators (Self study)* - Type conversions in expressions - Operator precedence - Mathematical functions. **Managing Input and Output Operations**: Introduction - Reading a character - writing a character - Formatted input - Formatted output. **Chapter 1: Sections : 1.1,1.2,1.8, Chapter 2: Sections : 2.1-2.8,2.10,2.11 Chapter 3: Sections : 3.1-3.12, 3.14-3.16,Chapter 4: Sections: 4.1- 4.5**	9
Unit II	**Decision Making and Branching**: Introduction - Decision making with if statement - Simple if statement - The If … else statement - Nesting of if … else statements - The else if ladder - The switch statement - The ?: operator - The Go to statement. **Decision Making and Looping:** Introduction - The while statement - The do statement - The for statement - Jumps in loops - Simple programs. **Arrays:** Introduction - One dimensional arrays - Declarations of One dimensional arrays - Initializations of One dimensional arrays - Two dimensional arrays - Initializing Two dimensional arrays. **Arrays and Strings**: Introduction - Declaring and initializing string variables - Reading strings from terminal - Writing strings to screen - Arithmetic operations on characters - Putting strings together - comparison of two strings - String handling functions - *Table of strings (Self study).* **Chapter 5: Sections : 5.1-5.9 ,Chapter 6: Sections :6.1-6.5.** **Chapter 7: Sections: 7.1 - 7.6 ,Chapter 8: Sections : 8.1 - 8.9.**	9
Unit III	**User defined Functions**: Introduction - Need for user defined functions - Multi-function Program - Elements of user defined functions - Definitions of functions - Return values and their types - Function Calls- Function Declaration - Category of Functions - No arguments and no return values - Arguments but no return values - Arguments with return values - No arguments but returns a value - Functions that return multiple values - Nesting of functions - Recursion. **Chapter 9 :Sections : 9.1 - 9.16**	9
Unit IV	**Pointers:** Introduction - Understanding pointers - Accessing the address of a variable - Declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer - Chain of Pointers - Pointer expressions - Pointer increments and scale factor - Pointers and arrays - Pointers and characters strings - Array of Pointers - Pointers as function arguments - Functions returning Pointers - Pointers to Functions . **Chapter 11: Sections: 11.1-11.15.**	9
Unit V	**File Management in C:** Introduction – Defining and Opening a File – Closing a File – Input / Output Operations on Files – Error Handling During I /O Operations – Random Access to files – Command Line Arguments. **Chapter 12: Sections: 12.1-12.5.**	9
	Total Contact Hrs.	**45**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

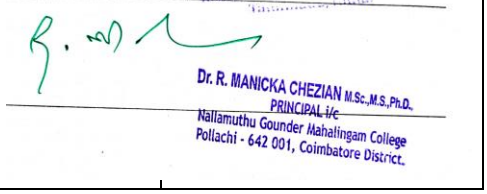
Balagurusamy E., *Programming in ANSI C*, 7th Edition, Tata McGraw Hill Publishing Company Ltd, Chennai, 2017.

Books for Reference:

1. Kernighan B. W and Ritchie D. M, *The C programming language*, Prentice Hall, 1997.
2. Kochan S. G, *Programming in C*, Hyden, 1983.
3. Venugopal, K. R and Prasad S. R, *Programming with C*, Tata McGraw Hill Publishing company ltd, 1997.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/55l-aZ7_F24
2. https://youtu.be/sY-s7O0FiYE

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS409	**Title**	**Batch:**	2026 - 2029
		Programming Lab in C	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	1

Course Objective

This course develops foundational programming skills using procedural concepts and problem-solving techniques. Students learn to write and debug programs for numerical computations, arrays, matrices, and conditional logic. It equips them to implement algorithms for data handling, mathematical operations, and real-world problems.

Course Outcomes (CO)

On completion of the course the students will be able to

CO Number	CO Statement	
CO1	Recall basic programming concepts, data types, operators, and control structures used in problem-solving.	PO1(3), PO2(1), PO3(1), PO5(1), PO8(2), PO10(1), PO15(1)
CO2	Explain the logic and flow of simple programs for temperature conversion, number checking, and sequence generation.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO14(2), PO15(1)
CO3	Write programs to perform tasks such as matrix operations, sorting lists, computing factorials/nCr, and Fibonacci sequences.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO7(1), PO8(2), PO9(1), PO10(2), PO11(1), PO14(2), PO15(1)
CO4	Analyze and debug programs for correctness, efficiency, and proper handling of conditions, loops, and arrays.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(3), PO7(1), PO8(3), PO9(1), PO10(3), PO11(1), PO14(2), PO15(2)
CO5	Evaluate and optimize solutions for real-world problems using programming constructs, including pointers and nested logic.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(3), PO11(2), PO13(1), PO14(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	2	–	1	–	–	–	–	1		
CO2	3	2	3	3	2	–	–	2	–	2	–	–	–	2	1		
CO3	3	1	2	3	3	–	1	2	1	2	1	–	–	2	1		
CO4	3	1	3	3	3	3	1	3	1	3	1	–	–	2	2		
CO5	3	1	3	3	3	2	1	3	2	3	2	–	1	1	3		

3 Point Scale – 1, 2, 3

List of Programs:

1. Program to convert the given temperature in Fahrenheit to Celsius.
2. Program to convert days into months and days.
3. Program to find the solution of quadratic equation.
4. Program for finding Fibonacci sequence.
5. Program to sort a list and find its median.
6. Program to calculate mean and standard deviation of a given series of numbers.
7. Program for finding the addition of two matrices.
8. Program for finding the multiplication of two matrices.
9. Program to sort a list of strings in alphabetical order.
10. Program to compute nCr value.
11. Program to check whether the number is prime or not.
12. Program to check whether the year is leap year or not.
13. Program to illustrate the use of pointers in one dimensional array.
14. Program to illustrate the error handling in file operations
15. Write a program to receive a file name and line of text as command line arguments and write the text to file.

Text Book:

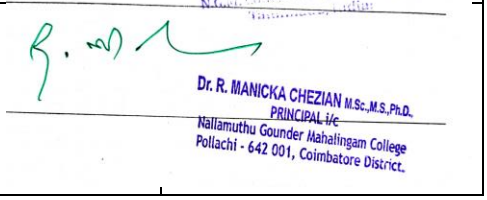
Balagurusamy E, *Programming in ANSI C*, 7th Edition, Tata McGraw Hill Publishing Company Ltd, Chennai, 2017.

Books for Reference:

1. Kernighan B. W and Ritchie D. M, *The C programming language*, Prentice Hall, 1997.
2. Kochan S. G, *Programming in C*, Hyden, 1983.
3. Venugopal, K. R and Prasad S. R, *Programming with C*, Tata McGraw Hill Publishing company ltd, 1997.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/D53l7rRPlSs
2. https://youtu.be/s9fF8aSfQwg

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

ProgrammeCode:	UMS			**ProgrammeTitle:**	B.A., / B.Sc., / B. Com.,	
CourseCode:	26UMS4S1			**Title**	**Batch:**	2026 - 2029
				SEC II: Naan Mudhalvan: QUANTITATIVE APTITUDE	**Semester:**	IV
LectureHrs./Week or PracticalHrs./Week	1+1	**Tutorial Hrs./Sem.**	5		**Credits:**	1

Course Objective

- To enable the students to refine their mathematical, logical, and analytical skills.
- The student will be able to answer real-life simple problems by using HCF and LCM.
- The student is able to apply the correct sequence of operations to find out the value of a given mathematical expression.
- The student will be able to solve the problem involving square roots, cube roots, and average.
- To make them prepare for various public and private sector exams and placement drives.
- To understand the functions of tableau for data process and deploy dashboard.

Course Outcomes

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

CO Number	CO Statement	
CO1	To have fundamental knowledge of Mathematics about problems of numbers using Mathematical formulae.	PO1(3), PO3(2), PO4(2), PO5(3), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	To understand the concepts of profit & loss related processing, simplification, etc.,	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(3), PO11(2), PO15(2)
CO3	To apply the formulae to real time problems on probability, Areas of surfaces and apply data visualization tool for any data set.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO4	To analyze the problems solving related to Age, Time and Distance and Time and Work etc. To examine their employability skills.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)

CO5	Use their logical thinking and analytical abilities to evaluate puzzle and decision making related questions from company specific and other competitive tests / To critically evaluate numerous possibilities related to puzzles. To develop their Competitive skills and improve the decision-making skills. To generate analytical reports and presentations using Data Interpretation.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	2	2	3	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	2	–	3	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	2	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	2	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs
Unit I	Numbers-HCF And LCM of Numbers-Decimal Fractions- Comparison of Fractions - Simplification- Square Root and Cube Roots – Average.	6
Unit II	Time and Work - Time and Distance – Mixtures or Allegations - Problems on Numbers - Problems on Ages –Percentage - Profits and Loss.	6
Unit III	Ratio and Proportion - Time and Work - Time and Distance - Simple Interest - Compound Interest - Area-Volume and Surface Area.	6
Unit IV	Permutation and Combination - Probability, Height and Distances - Boats and Streams - Odd Man Out &Series.	6
Unit V	Interpretation: Tabulation, Bar Graphs, Pie Chart, Line Charts.	6
	Total Contact Hrs	**30**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods

Seminar, Quiz, Assignments, GroupTask.

Text Book

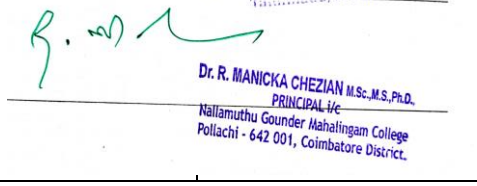
R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S.Chand& Company Ltd., New Delhi, 2018.

Reference Books

1. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson's Publications, New Delhi, 2nd Edition, 2013.
2. Praveen R.V., Quantitative Aptitude and Reasoning, PHI Learning Pvt. Ltd., New Delhi. 3rd Edition, 2016.
3. Rajesh Varma, Fast Track Objective Arithmetic, Arihant PublicationsIndia Limited, New Delhi, 2018.
4. AbhijitGuha, Quantitative Aptitude for Competitive Examinations, McGraw Hill Education (India) Private Limited. 7th Edition, 2020.
5. Sarvesh K Verma, Quantitative Aptitude Quantum CAT, Arihant PublicationsIndia Limited, New Delhi; Twelve edition, 2022.

Related Online Contents [MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.javatpoint.com/aptitude/quantitative
2. https://www.toppr.com/guides/quantitative-aptitude/
3. https://www.tutorialspoint.com/quantitative_aptitude/index.htm
4. https://www.sscadda.com/quantitative-aptitude/
5. https://prepinsta.com/learn-aptitude/
6. https://www.indiabix.com/
7. https://www.icai.org/post.html?post_id=17790
8. https://tnpsc.news/tnpsc-study-materials
9. http://www.kalvisolai.com/p/kalvisolai-tnpsc-study-materials.html
10. https://byjus.com/free-ias-prep/tnpsc-study-material/

Course Designed by	Dr. M. MAHESWARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

	UMS			**ProgrammeTitle:**	B.A., / B.Sc., / B. Com.,	
CourseCode:	26UMS4S2			**Title**	**Batch:**	2026 - 2029
				SEC II: Naan Mudhalvan: MATHEMATICS FOR COMPETITIVE EXAMINATIONS	**Semester:**	IV
LectureHrs./Week or PracticalHrs./Week	1*1†	**Tutorial Hrs./Sem.**	5		**Credits:**	1

Course Objective

The primary objective of this course is to equip students with the necessary mathematical skills to solve problems commonly encountered in competitive examinations. This will involve understanding and applying concepts in averages, numbers, profit and loss, ratio and proportion, partnership, interest calculations, and series patterns.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recall basic formulas and concepts related to averages, numbers, profit & loss, ratios, proportions, partnership, and interest calculations.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(1), PO10(2), PO11(1), PO15(1)
CO2	Understand and explain the methods for solving problems on numbers, financial calculations, and numerical series.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Apply formulas and techniques to solve numerical problems on averages, ratio & proportion, partnership, simple & compound interest, and number series.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(2), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze numerical data to identify patterns, odd man out, and series, and determine appropriate problem-solving strategies.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate solutions and justify reasoning for problems in numbers, profit & loss, interest calculations, and numerical series.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	1	–	2	1	–	–	–	1		
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	2	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs
UnitI	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).**	6
UnitII	Profit and Loss **Section-I – Chapter 11 – Solved examples 1-29 only (Page No.251- 256).**	6
Unit III	Ratio and Proportion, Partnership **Section-I – Chapter 12 – Solved examples 1-7 only (Page No.294- 296), Chapter 13 (Page No.311-325).**	6
UnitIV	Simple Interest, Compound Interest **Section-I – Chapter 21 – Solved examples 1-12 only (445-447), Chapter 22 – Solved examples 1-15 only (466-470).**	6
UnitV	Odd Man Out and Series **Section-I – Chapter 35 (Page No.649-657)**	6
	Total Contact Hrs	**30**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods

Seminar, Quiz, Assignments, GroupTask.

Text Book

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

ReferenceBooks

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

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://ncert.nic.in/ncerts/l/gemh108.pdf
2. https://ncert.nic.in/textbook/pdf/femh112.pdf?html
3. https://ncert.nic.in/ncerts/l/hemh108.pd

Course Designed by	Dr. M. MAHESWARI	M.Mallesh
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS4N1	**Title**	**Batch:**	2026 - 2029
		Non Major Elective II: QUANTITATIVE APTITUDE – II	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	1		**Credits:**	1

Course Objective

The objective of this syllabus is to make the students to clear competitive examination like Banking recruitment, Postal recruitment, Railway recruitment and TNPSC exams.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall basic concepts, formulas, and definitions related **to** problems on ages, time and work, time and distance, trains, and boats & streams**.**	PO1(3), PO2(1), PO3(1), PO5(1), PO8(1), PO15(1)
CO2	Explain the relationships and underlying concepts in time and work, relative speed, and age-based problems, and interpret them in simple situations.	PO1(3), PO2(1), PO3(2), PO4(1), PO5(2), PO8(2), PO11(1), PO15(1)
CO3	Apply appropriate formulas and techniques to solve problems involving ages, time and work, time and distance, trains, and boats & streams**.**	PO1(3), PO2(1), PO3(3), PO4(3), PO5(2), PO6(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze and differentiate between various problem types such as relative speed (trains), upstream/downstream (boats), and work efficiency**,** and select suitable solution strategies.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO8(3), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate and solve complex and multi-step problems by choosing efficient methods in time & work, trains, and boats & streams**,** and verify the correctness of results.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(3), PO9(1), PO10(1), PO11(2), PO13(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	1	–	–	–	–	–	–	1		
CO2	3	1	2	1	2	–	–	2	–	–	1	–	–	–	1		
CO3	3	1	3	3	2	1	–	2	–	1	1	–	–	–	2		
CO4	3	1	3	3	3	1	–	3	1	1	1	–	–	–	2		
CO5	3	2	3	3	3	1	1	3	1	1	2	–	1	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Problems on ages**: Problems on ages - Simple problems. **Chapter 8**.	3
Unit II	**Time and work**: Time and work - Simple problems. **Chapter 15**.	3
Unit III	**Time and Distance :** Time and Distance - Simple problems **Chapter 17.**	3
Unit IV	**Problems on trains**: Problems on trains with solved examples. **Chapter 18**	3
Unit V	**Boats and Streams:** Boats and Streams- Simple problems **Chapter 19**.	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

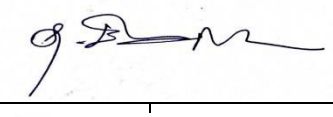
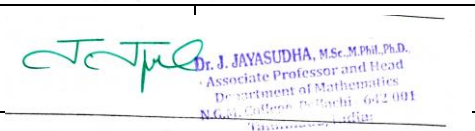
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Aggarwal R. S, *Quantitative Aptitude,* S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/KE7tQf9spPg
2. https://youtu.be/ufbDCFUn6PY

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS4N2	**Title**	**Batch:**	2026 - 2029
		Non Major Elective II: ASTRONOMY – II	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	1		**Credits:**	1

Course Objective

This paper enables the learners to learn about the Moon and Ellipses.

Course Outcomes (CO)

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

CO Number	**CO Statement**	
CO1	Recall fundamental concepts, definitions, and key terms related **to** the Moon (phases, motions), eclipses, planetary phenomena, and astronomical instruments**.**	PO1(3), PO2(1), PO3(1), PO5(1), PO8(2), PO15(1)
CO2	Explain the concepts of sidereal and synodic months, phases of the Moon, eclipses, and planetary positions**,** and describe the working principles of basic astronomical instruments**.**	PO1(3), PO2(2), PO3(2), PO4(1), PO5(2), PO8(3), PO10(1), PO11(1), PO15(1)
CO3	Apply knowledge to interpret lunar phases, calculate time-related phenomena, and identify planetary positions using concepts such as elongation, opposition, and conjugation.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(2), PO6(1), PO8(3), PO10(1), PO11(1), PO15(2)
CO4	Analyze lunar motions (librations, perturbations), eclipse phenomena, and planetary movements**,** and differentiate between various astronomical events and observational methods.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(1), PO10(1), PO11(1), PO15(2)
CO5	Evaluate astronomical observations and measurements using astronomical instruments, and interpret complex phenomena related to the Moon, eclipses, and planetary motion**.**	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(2), PO11(2), PO13(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	–	1	–	–	2	–	–	–	–	–	–	1		
CO2	3	2	2	1	2	–	–	3	–	1	1	–	–	–	1		
CO3	3	2	3	2	2	1	–	3	–	1	1	–	–	–	2		
CO4	3	2	3	3	3	2	–	3	1	1	1	–	–	–	2		
CO5	3	2	3	3	3	2	1	3	1	2	2	–	1	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**The Moon:** Introduction - Sidereal month - Synodic month Elongation - Conjugation - Opposition - Quadratures Daily motion of the moon - Age of moon - Phase of moon. **Chapter 12: Sections: 228 – 238**	3
Unit II	**The Moon:** Moon exhibits the same side to the earth -Lunar Librations - summer and winter full moons path of the moon with respect to the sun - Perturbations of lunar orbit. **Chapter 12: Sections: 241 – 245**	3
Unit III	**Eclipses:** Introduction – Umbra and penumbra – Lunar eclipse – Solar eclipse – Length of earth's shadow **Chapter 13: Sections: 254 -257 and 264**	3
Unit IV	**Planetary Phenomena**: Introduction – Bode's law – Elongation – Conjugation, opposition and quadratures – Heliocentric motion of a planet. **Chapter 14: Sections: 283,284 and 286 – 288**	3
Unit V	**Astronomical Instruments**: Sidereal clock – Chronometer – Gnomon Sundial – The sextant. **Chapter 15: Sections: 303-306 and 310**	3
	Total Contact Hrs.	**15**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

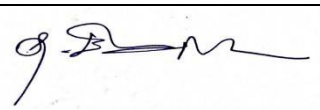
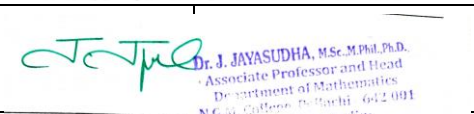
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kumaravelu S and SusheelaKumaravelu, *Astronomy for degree classes*,7th edition 1986.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://youtu.be/6Vc9ZiJ0qqw
2. https://youtu.be/qdI-1p21Cio

Course Designed by	Mr. S. EARNEST RAJADURAI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

VALUE ADDED COURSE-II

Programme Code:	UMS			**Programme Title:**	B. Sc.Mathematics	
Course Code:	26UMS4VA			**Title**	**Batch:**	2026-2029
				ANDROID APP DEVELOPMENT	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	-	**TutorialHrs./Sem.**	30		**Credits:**	2*

Course outcomes (CO)

At the end of this course, the students will be able to

CO Number	CO Statement	
CO1	Recall the fundamentals of Android, including Android framework, architecture, application components, and development tools.	PO1(3), PO2(1), PO3(1), PO4(1), PO8(1), PO11(1), PO15(1)
CO2	Understand Android project structure, manifest file, activity lifecycle, and SDK tools used in application development.	PO1(3), PO3(2), PO4(2), PO5(2), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Apply concepts of fragments, views, list views, intents, and intent filters to develop basic Android applications.	PO1(3), PO3(2), PO4(3), PO5(3), PO6(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze Android layouts, UI components, and system views to design interactive and user-friendly applications.	PO1(3), PO3(3), PO4(2), PO5(3), PO6(2), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate and develop complete Android applications using dialogs, menus, web view, and user interaction techniques.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(2), PO11(2), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	–	–	–	1	–	–	1	–	–	–	1		
CO2	3	–	2	2	2	–	–	2	–	1	1	–	–	–	1		
CO3	3	–	2	3	3	1	–	2	–	1	1	–	–	–	2		
CO4	3	–	3	2	3	2	–	3	1	2	1	–	–	–	2		
CO5	3	–	3	3	3	2	1	3	2	2	2	–	–	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Android Framework and Android Studio:** Introduction- Android software Layers - Components of an Android Application – Pre-requisite of Android Application Development – Android Studio / Eclipse	5
Unit II	**Android SDK Tools and Activity Class:** Android Project Structure- Android Manifest File – Structure of Manifest File- Activity	8
Unit III	**Fragment views and List View:** Introduction – Fragments – Views – List views and List Activity	7
Unit IV	**Intents and Intent Filters:**Introduction – Native Android Action –Data Transfer – Intent to Call activities – Register and Intent Filter	5
Unit V	**Android Layout and System views:**Introduction – Views – Layouts – Customized Views. **Android UI – Dialogs, Menus and Web view:** Introduction – User Interaction – Dialogs – Toasts –Context Menu – Option Menu – Web View.	5
	Total Contact Hrs.	**30**

Course Designed by	Profenaa Industrial Training Center		
Verified by HoD	Dr. J. JAYASUDHA		
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN		

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS510	**Title**	**Batch:**	2026 - 2029
		ABSTRACT ALGEBRA	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

At the end of the course the student have the ability to to understand, analyze, and apply abstract algebraic concepts, while strengthening logical reasoning, proof-writing skills, and problem-solving abilities. It also prepares students for advanced studies in pure and applied mathematics and equips them with analytical skills relevant to competitive exams and professional fields.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	
CO1	Recall and define fundamental concepts of algebraic structures including sets, mappings, groups, rings, subgroups, and ideals.	PO1(3), PO2(1), PO3(1), PO4(1), PO5(1), PO8(2), PO9(1), PO10(1), PO11(2), PO15(2)
CO2	Explain the properties and structures of groups and rings, including subgroup criteria, homomorphisms, normal subgroups, quotient structures, and special classes of rings.	PO1(3), PO2(2), PO3(2), PO4(2), PO5(2), PO8(2), PO9(2), PO10(1), PO11(2), PO15(2)
CO3	Apply group and ring theory concepts to solve problems involving subgroups, cyclic groups, permutation groups, homomorphisms, quotient groups, ideals, and quotient rings.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(3), PO9(2), PO10(2), PO11(2), PO14(1), PO15(3)
CO4	Analyze algebraic structures using theorems such as Cayley's Theorem, isomorphism properties, counting principles, and structure of Euclidean rings and integral domains..	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(3), PO10(2), PO11(3), PO14(1), PO15(3)
CO5	Evaluate and compare different algebraic structures, determine structural properties (like normality, isomorphism, and factor structures), and justify results using appropriate algebraic reasoning.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(3), PO10(2), PO11(3), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	1	–	–	2	1	1	2	–	–	–	2		
CO2	3	2	2	2	2	–	–	2	2	1	2	–	–	–	2		
CO3	3	2	3	3	3	1	1	3	2	2	2	–	–	1	3		
CO4	3	2	3	3	3	2	1	3	3	2	3	–	–	1	3		
CO5	3	3	3	3	3	2	1	3	3	2	3	–	–	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Preliminary Notions:** *Set Theory (Self study)-Mappings(Self study)*. **Group Theory:** Definition of a Group - Some Examples of Groups - Some preliminary Lemmas – Subgroups – A Counting Principle. **Chapter 1:In Section 1.1, Theorem 1.1.1 only** **In Section 1.2, Lemma 1.2.1 onwards** **Chapter 2: Sections: 2.1 - 2.5.**	18
Unit II	**Group Theory:** Normal Subgroups and Quotient Groups -Homomorphisms. **Chapter 2: Sections: 2.6, 2.7.**	18
Unit III	**Group Theory:** Automorphisms - Cayley's Theorem - Permutation Groups – Another Counting Principle. **Chapter 2: Sections: 2.8 - 2.11.**	18
Unit IV	**Ring Theory:** Definition and Examples of Rings - Some Special Classes of Rings - Homomorphisms - Ideals and Quotient Rings. **Chapter 3: Sections: 3.1 - 3.4.**	18
Unit V	**Ring Theory:** More Ideals and Quotient Rings - The Field of Quotients of an Integral Domain - Euclidean Rings - A Particular Euclidean Ring. **Chapter 3: Sections: 3.5 - 3.8**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

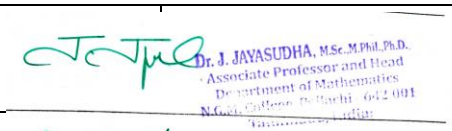
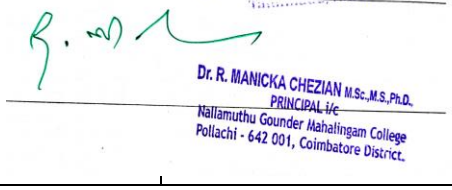
Herstein, I. N, *Topics in Algebra*, Wiley India Pvt. Ltd., New Delhi,2nd Edition, 2010.

Books for Reference:

1. Bhattacharya. P. B, Jain S. K, *A first course in group theory*, Wiley Eastern Pvt. Ltd, 1972.
2. Herstein I. N, *Abstract Algebra*, Prentice-Hall international, 1996.
3. Surjeetsingh, Qazizameeruddin, *Modern Algebra*, Vikas Publishing House Pvt. Ltd, Second Edition, 1975.
4. Santiago M.L, *Modern Algebra*, Tata McGraw Hill, 2003.
5. R. Balakrishnan and N. Ramabhadran, *A Text Book of Modern Algebra*, Vikas, New Delhi, 2000.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/106/111106137/
2. https://nptel.ac.in/courses/111/105/111105112/

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS511	**Title**	**Batch:**	2026 - 2029
		REAL ANALYSIS - I	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

To enable the learner to get into basic concepts of Real Analysis and obtain a foundation for further study in analysis.

Course Outcomes (CO)

On successful completion of the course student will be able to

CO Number	**CO Statement**	
CO1	Understand and remember the fundamental properties of the real numbers which underpin the formal development of real analysis. Recall and explain fundamental concepts of real numbers, set theory, and topology, including number systems, functions, sequences, and basic topological notions.	PO1(3), PO3(2), PO4(1), PO5(2), PO6(1), PO8(1), PO11(1), PO15(2)
CO2	Apply properties of real numbers, set operations, and functions to solve mathematical problems involving sequences, inequalities, and countability.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(2), PO8(1), PO10(1), PO15(2)
CO3	Analyze topological structures in Euclidean and metric spaces, including open and closed sets, limit points, compactness, and convergence.	PO1(3), PO3(3), PO4(2), PO5(3), PO8(2), PO9(1), PO12(1), PO15(1)
CO4	Evaluate limits, continuity, and completeness in real and metric spaces, and investigate properties such as Cauchy sequences, uniform continuity, and connectedness through rigorous reasoning and proofs.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO11(1), PO12(2), PO13(2), PO15(2)
CO5	Utilize appropriate digital and mathematical tools to explore, visualize, and model concepts in real analysis, and apply them to solve problems effectively.	PO1(3), PO3(3), PO4(3), PO5(2), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO13(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	1	2	1	-	1	-	-	1	-	-	-	2		
CO2	3	3	3	3	2	-	-	1	-	1	-	-	-	-	2		
CO3	3	-	3	2	3	-	-	2	1	-	-	1	-	-	**1**		
CO4	3	2	3	3	3	3	-	3	-	-	1	2	2	-	2		
CO5	3	-	3	3	2	3	-	3	2	3	2	-	2	-	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Unit -1** **The Real and Complex number Systems**: Introduction - The field axioms - The order axioms – Geometric representation of real numbers-Intervals - Integers - The unique factorization theorem for integers - Rational numbers - Irrational numbers - Upper bounds, maximum element, least upper bound - The completeness axiom - Some properties of the supremum - Properties of the integers deduced from the completeness axiom - The Archimedean property of the real number system- Absolute values and the triangle inequality - The Cauchy Schwarz inequality - Plus and minus infinity and the extended real number system R*. **Chapter 1: Sections: 1.1 - 1.20 (Except 1.15 - 1.17).**	18
Unit II	**Some Basic Notations of Set Theory**: Ordered pairs - Cartesian product of two sets - Relations and functions - One to one functions and inverses - Composite functions - Sequences -Similar sets - Finite and infinite sets - Countable and uncountable sets - Unaccountability of the real number system - Set algebra - Countable collections of countable sets. **Chapter 2: Sections: 2.3 - 2.15 (Except 2.6).**	18
Unit III	**Elements of Point Set Topology**: Euclidean space R^n- Open balls and open sets in R^n- The structure of open sets in R^1 - Closed sets - Adherent points, Accumulation points - Closed sets and adherent points - The Bolzano-Weierstrass theorem - The Cantor intersection theorem - Lindelof covering theorem - The Heine-Borel covering theorem- Compactness in R^n . **Chapter 3: Sections: 3.2 - 3.12.**	18
Unit IV	**Elements of Point Set Topology**: Metric spaces - Point set topology in metric spaces - Compact subsets of a metric space - Boundary of a set. Limits and Continuity: Convergent sequences in a metric space - Cauchy sequences - Complete metric spaces - Limit of a function - Limits of vector valued functions. **Chapter 3: Sections: 3.13 - 3.16, Chapter 4: Sections : 4.2 - 4.5, 4.7.**	18
Unit V	**Limits and Continuity**: Continuous function - Continuity of composite functions - Continuity and inverse images of open or closed sets - Connectedness - Uniform continuity - Uniform continuity and compact sets - Discontinuities of real valued functions - Monotonic functions. **Chapter 4: Sections: 4.8, 4.9, 4.12, 4.16, 4.19, 4.20, 4.22, 4.23.**	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

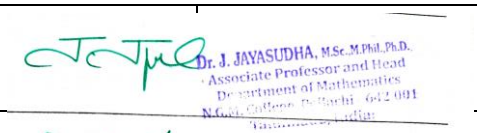
Tom M. Apostal, *Mathematical Analysis*, Addison Wesley, Second Edition 2002.

Books for Reference:

1. Ralp P. Boas, *A primer of Real function*, The mathematical Association of America, 1960.
2. Walter Rudin, *Principles of Mathematical Analysis*, Third Edition, McGraw Hill Inter Editions, 1976.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/106/111106053/
2. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/
3. https://cosmolearning.org/courses/real-analysis-with-prof-sh-kulkarni/

Course Designed by	Dr. S. KALEESWARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS512	**Title**	**Batch:**	2026 - 2029
		NUMERICAL TECHNIQUES	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	4		**Credits:**	3

Course Objective

This course helps the students to have an in-depth knowledge of various advanced methods in numerical analysis. The students to use numerical techniques to get numerical solutions of equations like transcendental and non-linear differential equations when ordinary analytical methods fail.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	
CO1	Understand the need of numerical analysis techniques in the areas of approximation theory, and recall some basic concepts.	PO1(3), PO2(1), PO3(2), PO4(1), PO5(2), PO6(1), PO8(2), PO10(1), PO11(1), PO15(1)
CO2	Apply the numerical methods for approximating the solution to problems of algebraic and transcendental equations, simultaneous linear equations.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(1), PO10(1), PO11(1), PO15(1)
CO3	Estimating the value of a function for any intermediate value of the independent variable using Newton Forward and Backward interpolation Formula as well compute the derivatives using Newton's forward and backward difference formula and Sterling's formula.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(1), PO10(1), PO11(1), PO15(1)
CO4	Solve the ordinary and partial differential equations by using Numerical method techniques like Taylors method, Euler's method, Runge Kutta method etc.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(1), PO10(2), PO11(2), PO15(2)
CO5	Enrich the knowledge of numerical techniques and getting insight of algorithmic approach.	PO1(3), PO2(2), PO3(2), PO4(2), PO5(2), PO6(2), PO7(1), PO8(3), PO9(2), PO10(2), PO11(3), PO12(1), PO13(1), PO14(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	1	2	1	-	2	-	1	1	-	-	-	1		
CO2	3	1	3	3	3	2	-	3	1	1	1	-	-	-	1		
CO3	3	1	3	3	3	2	-	3	1	1	1	-	-	-	1		
CO4	3	1	3	3	3	3	-	3	1	2	2	-	-	-	2		
CO5	3	2	2	2	2	2	1	3	2	2	3	1	1	1	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**The solution of Numerical Algebraic and Transcendental Equations**: Introduction - The Bisection method - The iteration method - The method of false position (Regula Falsi Method) - Newton Raphson method. (Problems only). **Text Book 1: Chapter 3: Sections: 1 - 5.**	12
Unit II	**Simultaneous Linear Algebraic Equations:** Introduction – Gauss Elimination Method – Gauss Jordan Method – Computation of the inverse of a Matrix using Gauss's Elimination Method (Problems only). **Chapter 4: Sections: 1 – 3.** **Simultaneous Linear Algebraic Equations:** Iterative Methods - Gauss-Jacobi Method – Gauss-Seidal Method – *Comparison of Gauss elimination and Gauss-Seidal Iteration methods (Self study).* **Chapter 4: Sections: 6, 7.**	12
Unit III	**Interpolation**: Introduction - Linear interpolation - Gregory Newton Forward and Backward interpolation Formula - Equidistant terms with one or more missing values. (Problems only). **Chapter 6: Sections: 1 - 5.** **Interpolation with unequal intervals:** Divided differences-Properties of Divided Differences-Newton's Interpolation Formula for unequal Intervals.(Problems only). **Chapter 8: Sections: 1 - 3.**	12
Unit IV	**Numerical Differentiation**: Introduction - Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the derivatives - Derivatives using Stirling's formula.(Problems only). **Chapter 9: Sections: 1 - 4.** **Numerical Integration**: The Trapezoidal rule - Romberg's method - Simpson's one third rule - Practical applications of Simpson's rule (Problems only). **Chapter 9: Sections: 8 -10 and 12.**	12
Unit V	**Numerical Solution of Ordinary Differential Equations**: Solution by Taylor Series - Taylor Series method for higher order differential equations- Euler's method - Improved Euler's method - Modified Euler method – Runge Kutta method - Second order Runge Kutta Method - *Higher order Runge Kutta methods (Self study)* (Problems only). **Chapter 11: Sections: 6, 8, 10 - 15**. **Numerical Solution of Partial Differential Equations**: Elliptic equations.(Problems only). **Chapter 12: Sections: 5.**	12
	Total Contact Hrs.	**60**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

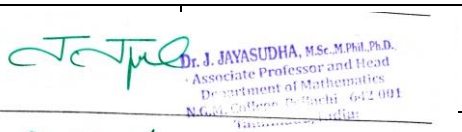
Venkataraman M. K, *Numerical Methods in Science and Engineering*,The National Publishing Company, Madras, 2009.

Book for Reference:

Kandasamy P, Thilagavathy K and Gunavathi K, *Numerical Methods,* S. Chand company Ltd, 2012.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

https://nptel.ac.in/courses/111/107/111107105/

Course Designed by	Dr. R. SANTHI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS513	**Title**	**Batch:**	2026 - 2029
		COMPLEX ANALYSIS	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

This course help the students to have an in depth knowledge of limits and continuity, analytic functions, uniform convergence, conformal mapping and Singularities.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Demonstrate disciplinary knowledge of complex functions, integrals, sequences, series and fundamental theorems across all five units.	PO1(3), PO2(1), PO5(2), PO8(2), PO10(1), PO11(1), PO15(2)
CO2	Apply concepts, critical thinking, and problem-solving skills to solve integrals, line integrals and problems in conformal mapping.	PO1(2), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO10(2), PO11(1), PO15(2)
CO3	Utilize digital and mathematical tools, software, and models; engage in self-directed learning through online courses, research articles and seminars to enhance lifelong learning.	PO1(2), PO2(1), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO10(3), PO11(1), PO15(3)
CO4	Analyze functions, sequences, series, singularities and integrals to draw logical and mathematical conclusions.	PO1(2), PO2(1), PO3(2), PO4(3), PO5(3), PO6(3), PO8(3), PO10(2), PO11(2), PO15(3)
CO5	Create, design and evaluate solutions for complex analysis problems, including proofs, mappings and local properties of functions.	PO1(2), PO2(1), PO3(2), PO4(3), PO5(3), PO6(3), PO8(3), PO10(3), PO11(3), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	–	–	2	–	–	2	–	1	1	–	–	–	2		
CO2	2	1	3	3	3	2	–	3	–	2	1	–	–	–	2		
CO3	2	1	3	3	3	3	–	3	–	3	1	–	–	–	3		
CO4	2	1	2	3	3	3	–	3	–	2	2	–	–	–	3		
CO5	2	1	2	3	3	3	–	3	–	3	3	–	–	–	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Introduction to the concept of analytic function**: Limits and Continuity – Analytic functions - Polynomials - *Rational Functions. (Self study)* **Chapter 1: Sections: 1.1 - 1.4**.	15
Unit II	**Elementary theory of power series**: Sequences - Series - Uniform Convergence – Power Series - Abel's Limit Theorem. **Chapter 2: Sections: 2.1 - 2.5**.	15
Unit III	**The Exponential, Trigonometric Functions:** *The Exponential –The Trigonometric Functions (Self study.* **Conformality**: Arcs and Closed Curves - Analytic Functions in Regions - Conformal Mapping. **Chapter 2: Sections: 3.1 – 3.2.** **Chapter 3: Sections: 2.1 - 2.3.**	15
Unit IV	**Fundamental Theorems**: Line Integrals – Line Integrals as Function of Arcs – Cauchy's Theorem in a Rectangle - Cauchy's Theorem in a Disk. **Cauchy's Integral Formula:**The Index of a Point with respect to a Closed Curve -.The Integral Formula. **Chapter 4 : Sections: 1.1, 1.3, 1.4 and 1.5.** **Chapter 4: Sections: 2.1- 2.2.**	15
Unit V	**Local Properties of Analytical functions**: Removable Singularities, Taylor's Theorem –Zeros and Poles - The Local Mapping – The Maximum Principle. **Chapter 4 : Sections: 3.1- 3.4**.	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

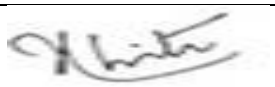
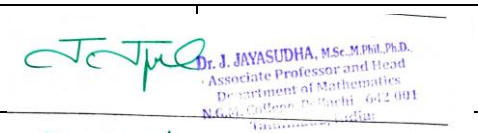
Lars V. Ahlfors, Complex Analysis, MCGRAW HILL international Edition, (Indian Edition), 2013.

Books for Reference:

1. Goyal& Gupta, *Functions of a Complex Variable* – Pragati's Edition, 2012.
2. Ponnusamy S., *Foundations of Complex Analysis* Narosa publishing house, Second Edition, 2009.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/107/111107056/
2. https://nptel.ac.in/courses/111/103/111103070/

Course Designed by	Dr. V. CHITRA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5E1	**Title**	**Batch:**	2026 - 2029
		Python Programming	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	3		**Credits:**	2

Course Objective

This course introduces the fundamentals of Python programming and core data structures like strings, lists, tuples, sets, and dictionaries. It teaches students to write and debug Python programs for problem-solving and statistical data analysis. Students will learn to analyze datasets, compute statistical measures, and apply Python in real-world scenarios.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall Python basics, data types, operators, control statements, and core functions for programming tasks.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain the concepts of functions, strings, lists, tuples, sets, and dictionaries, and their use in data processing.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Write Python programs to solve problems using loops, functions, and data structures for statistical calculations.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze datasets to compute mean, median, range, frequency distribution, and identify trends using Python structures.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate and interpret results from Python-based statistical data analysis, ensuring correctness and efficiency in computations.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Introduction:** History of Python – Executing Python Programs – Commenting in Python – Internal Working of Python - Python Character Set – Token – Python Core Data Type – print() Function – Assigning Values to Variables – Multiple Assignments – input() Function – eval() Function – Formatting Numbers and Strings – Python Inbuilt Functions - Decision and Loop Control Statements	9
Unit II	**Functions:** Introduction – Syntax and Basics of Function – Use of a Function – Parameters and Arguments in a Function – Local and Global Scope of a variable – return Statement – Recursive Functions – Lambda function. **Strings:** Introduction – str class – Basic Inbuilt Python Functions for String – Traversing String with for and while Loop – Immutable Strings – Various String Operations.	9
Unit III	**Lists**: Introduction – Creating Lists – Accessing the Elements of a List – Negative List Indices – List Slicing - List Slicing with Step Size – Python Inbuilt Functions for Lists – List Operator – List Comprehensions – List methods – List and Strings – Splitting a String in List – Passing and Returning List from a Function. **Tuples :** Creating Tuples - tuple() Function - Inbuilt Functions for Tuples - Indexing and Slicing - Operations on Tuples - Passing Variable Length Arguments to Tuples - Lists and Tuples - Sort Tuples - Traverse Tuples from a List - zip() Function - Inverse zip(*) Function	9
Unit IV	**Sets:** Creating Sets - Set in and not in Operator - Python Set Class - Set Operations. **Dictionaries**: Need of Dictionaries - Basics of Dictionaries - Creating a Dictionary - Adding and Replacing Values - Retrieving Values - Formatting Dictionaries - Deleting Items - Comparing Two Dictionaries - Methods of Dictionary Class - Traversing Dictionaries - Nested Dictionaries - Traversing Nested Dictionaries.	9
Unit V	**Case Studies in Statistical Data Analysis using Python:** **Case Study 1**: Student Marks Analysis: Case Study - Read marks of students using lists - Compute mean, median, and range - Identify highest and lowest marks - Count number of students above and below average 2: **Frequency Distribution of Data: Case Study 4: Set Operations in ProbabilityCase Study 5: Statistical Data Processing from File**	9
	Total Contact Hrs.	45

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Ashok Namdev Kamthane, Amit Ashok Kamthane, Programming and Problem Solving with PYTHON, McGraw Hill Education (India) Private Limited, First Edition, 2018.

Books for Reference:

1. Allen Downey, Jeffrey Elkner, Chrish Meyers, How to Think like a Computer Scientist-Learning with Python, Dreamtech Press, Reprint Edition 2016.
2. Timothy A, Budd, Exploring Python, McGraw Hill Education India Private Limited, Tenth Reprint, 2017
3. Peter Norton et al., Beginning Python, Wiley &Dreamtech Press, 2006.
4. Al Sweigart, Automate the Boring Stuff with Python: Practical Programming for Total Beginners, No Starch Press, 2nd Edition, 2019
5. Liang Y. Daniel, Introduction to Programming Using Python, Pearson Education, 2017

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/9Zf1OMX2qSs
2. https://youtu.be/PE8Dcvyk4KU
3. https://youtu.be/vG1V66mnrkQ
4. https://youtu.be/UlYJrnp4F2U

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc., M.Phil., Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5E2	**Title**	**Batch:**	2026 - 2029
		ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	3		**Credits:**	2

Course Objective

This course introduces the fundamentals of Artificial Intelligence, including intelligent agents, problem-solving, reasoning, decision-making, and machine learning. It develops the ability to analyze and implement AI algorithms for solving real-world problems. Students will learn to apply AI techniques in multi-agent systems, statistical analysis, and decision-making scenarios.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the fundamentals of AI, intelligent agents, problem-solving methods, knowledge representation, and basic machine learning concepts.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain the concepts of search strategies, heuristics, constraint satisfaction, fuzzy logic, probabilistic reasoning, and decision-making in AI systems.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(3), PO10(2), PO11(2), PO15(2)
CO3	Apply AI techniques such as search algorithms, Bayesian inference, utility-based decision making, and neural network modeling to solve simple problems.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze AI problems to choose appropriate methods, evaluate algorithms, and interpret outcomes in reasoning, decision-making, and learning tasks.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate AI models, probabilistic reasoning approaches, machine learning algorithms, and multi-agent decisions to determine optimal solutions for complex scenarios.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	3	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**INTRODUCTION:** The Introduction of AI - The History of AI - Intelligent agents – Agents based system. PROBLEM SOLVING: State Space models – Searching for solution – Uniformed/ Blind search – Informed/Heuristic search - A* search - Hill - climbing search - Meta Heuristic: Genetic Algorithm - Adversary based search: Minimax- Expect Imax- Alpha Beta pruning - Constraint satisfaction problem - Backtracking search.	9
Unit II	**KNOWLEDGE REPRESENTATION AND REASONING**: Knowledge representation - Logics - bivalent logic - inference - Fuzzy logic: membership - Fuzzy rules and reasoning - Fuzzy inference	9
Unit III	**UNCERTAIN KNOWLEDGE AND PROBABILISTIC REASONING**: Uncertainty - Probabilistic reasoning - Semantics of Bayesian network - Exact inference in Bayesian network- Approximate inference in Bayesian network -Probabilistic reasoning overtime Inference in temporal models – Hidden Markov Models Dynamic Bayesian Networks	9
Unit IV	**DECISION-MAKING**: Basics of utility theory, Utility functions - Sequential decision problems - Markov decision process - Value iteration – Policy iteration - Decisions in Multi agent system: Multi agent decision theory - Group decision making	9
Unit V	**Machine learning:** Introduction- Probability distributions: Binary variables, Multinomial variables. Neural networks feed forward network function-Error propagation. Kernel methods-radial bias function networks .Graphical models-Bayesian networks-Discrete variables, linear Gaussian model. Mixture models and EM-K means clustering-.Combining models-Boosting Algorithm.	9
	Total Contact Hrs.	45

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2014.
2. David Pool and Alan Mackworth, *Artificial Intelligence: Foundations of Computational agents*, Cambridge University Press, 2017.
3. Christopher M.Bishop, *Pattern Recognition and Machine Learning*, Springer, 2013.

Books for Reference:

1. C. S. Krishnamoorthy, S.. Rajeev, *Artificial Intelligence and Expert Systems for Engineers,*CRCPress, 1996.
2. Nils J. Nilsson, *The Quest for Artificial Intelligence: A History of Ideas and achievements,*Cambridge University press, 2010.
3. AlpaydinEthem,*Introduction to Machine Learning,* Massachusetts Institute of Technology Press, 2009.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. **https://youtu.be/yaL5ZMvRRqE**
2. **https://youtu.be/ukzFI9rgwfU**

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5E3	**Title**	**Batch:**	2026 - 2029
		R Programming	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	3		**Credits:**	2

Course Objective

This course aims to introduce students to the fundamentals of R programming and statistical analysis. Students will learn how to install and use R, perform data manipulation, implement statistical techniques, visualize data, and apply regression models for data analysis and prediction.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the basics of R programming, including data types, syntax, operators, functions, and R IDE features.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2), PSO1(3), PSO2(2)
CO2	Explain R data structures, data manipulation techniques, data visualization, and statistical methods for analysis.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(3), PO10(2), PO11(2), PO15(2), PSO1(3), PSO2(2)
CO3	Apply R programming skills to import, clean, preprocess, and analyze datasets using vectors, lists, matrices, data frames, and factors.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2), PSO1(3), PSO2(3)
CO4	Analyze datasets using descriptive statistics, correlation, regression, time series, and visualization techniques to extract insights.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2), PSO1(3), PSO2(3)
CO5	Evaluate data analysis results and generate meaningful reports, plots, and forecasts for real-world datasets using R.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3), PSO1(3), PSO2(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	3	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Introduction to R Programming – R installation – R IDE – Advantages and disadvantages – R packages – Basic syntax – Data types – Variables – Operators and keywords – Decision making – Looping – Functions.	9
Unit II	String manipulation – R data structures – Vectors – Lists – Arrays – Matrix – Data frames – Factors.	9
Unit III	Data reshaping – Object oriented programming – R debugging – Data interfaces: CSV files, Excel files, Binary files, XML and JSON files. Data visualization: Pie chart, Bar chart, Boxplot, Histogram, Line graph and Scatter plot.	9
Unit IV	Statistics with R – Mean, Median and Mode – Linear Regression – Logistic Regression – Normal distribution – Binomial distribution – Classification – Time series analysis – Basic data analysis with R.	9
Unit V	Applications of R in Data Analysis: Data Import and Export in R – Reading and Writing Data Files – Working with CSV and Excel files. Data Cleaning and Preprocessing – Handling Missing Values – Data Transformation and Data Filtering - Exploratory Data Analysis – Descriptive Statistics – Correlation Analysis - Introduction to Data Visualization using ggplot2 – Advanced Graphs and Plots - Introduction to Time Series Data – Basic Forecasting Techniques – Case Studies using R.	9
	Total Contact Hrs.	45

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

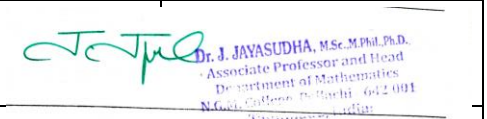
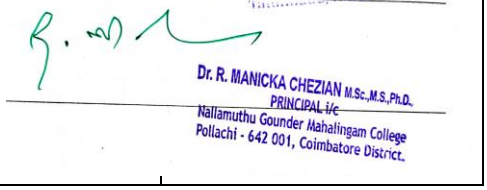
1. Paul Teetor, R Cookbook, O'Reilly Publications.
2. Norman Matloff, The Art of R Programming, No Starch Press.
3. SandipRakshit, R Programming for Beginners, Tata McGraw Hill.

Books for Reference:

1. Hadley Wickham and Garrett Grolemund, *R for Data Science*, O'Reilly Media, 2017.
2. Jared P. Lander, *R for Everyone,* Addison-Wesley Professional, 2014.
3. Tilman M. Davies, *The Book of R: A First Course in Programming and Statistics*, No Starch Press, 2016.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.coursera.org/learn/r-programming
2. https://www.datacamp.com/courses/free-introduction-to-r
3. https://cran.r-project.org/manuals.html

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS5E4	Title	Batch:	2026 - 2029
		Programming Lab in Python	Semester:	V
Lecture Hrs./Week or Practical Hrs./Week	2		Credits:	1

Course Objective

- To know and understand the basics of Python programming.
- To able to understand the concepts of decision and control statements.
- To learn the concepts of functions and strings.
- To use Python data structures – lists, tuples and dictionaries.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall basic Python syntax, data types, and built-in functions to perform simple computations and operations.	PO1(3), PO2(1), PO3(1), PO4(1), PO5(1), PO8(1), PO10(2), PO11(2), PO15(2)
CO2	Explain the working of Python functions, recursion, and standard data structures such as lists, tuples, and sets.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO7(1), PO8(2), PO9(1), PO10(2), PO11(2), PO15(2)
CO3	Develop Python programs to solve basic problems such as calculators, palindrome checking, factorial computation, and vowel counting.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO7(1), PO8(2), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze numerical data using Python by applying statistical measures such as mean, median, range, and frequency distribution.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(3), PO11(2), PO15(3)
CO5	Evaluate and select appropriate data structures and techniques (lists, tuples, sets, dictionaries) for solving real-world problems efficiently.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(3), PO11(3), PO14(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	1	-	-	1	-	2	2	-	-	-	2		
CO2	3	2	3	3	2	-	1	2	1	2	2	-	-	-	2		
CO3	3	2	3	3	3	1	1	2	1	3	2	-	-	-	2		
CO4	3	2	3	3	3	2	1	3	2	3	2	-	-	-	3		
CO5	3	2	3	3	3	2	1	3	2	3	3	-	-	1	3		

3 Point Scale – 1, 2, 3

List of programs:

1. Write a python program to develop a Simple Calculator using eval()
2. Develop a python code for number statistics using Inbuilt Functions
3. Write a function in python to Check Palindrome String.
4. Write a recursive function to find the factorial of a number
5. Write a python program to count vowels in a string using Function and Lambda
6. Write a python code to demonstrate list operations
7. Write a python code to demonstrate tuple operations
8. Write a python code to demonstrate basic set operations
9. Write a python program to check whether an element exists in a set
10. Write a Python program to read the marks of 10 students and store them in a list. Compute and display the following: Mean of the marks, Highest mark, Lowest mark, Range of marks.
11. Write a Python program to store rainfall values for 15 days in a list. Create a frequency distribution table using a dictionary that displays each rainfall value and its corresponding frequency.
12. Write a Python program to store numerical data (for example, heights of students) using a list or tuple. Compute and display the following: Mean, Median, Range. Display the result using formatted output

Text Book:

Ashok Namdev Kamthane, Amit Ashok Kamthane, Programming and Problem Solving with PYTHON, McGraw Hill Education (India) Private Limited, First Edition, 2018.

Books for Reference:

1. Allen Downey, Jeffrey Elkner, Chrish Meyers, How to Think like a Computer Scientist- Learning with Python, Dreamtech Press, Reprint Edition 2016.

2. Timothy A, Budd, Exploring Python, McGraw Hill Education India Private Limited, Tenth Reprint, 2017.

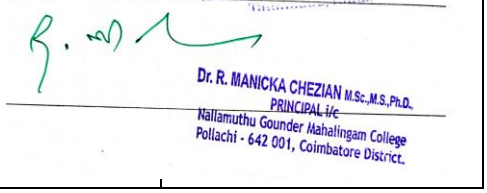
3. Peter Norton et al., Beginning Python, Wiley &Dreamtech Press, 2006.

4.Al Sweigart, Automate the Boring Stuff with Python: Practical Programming for Total Beginners, No Starch Press, 2nd Edition, 2019

5. Liang Y. Daniel, Introduction to Programming Using Python, Pearson Education, 2017

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/9Zf1OMX2qSs
2. https://youtu.be/PE8Dcvyk4KU
3. https://youtu.be/vG1V66mnrkQ
4. https://youtu.be/UlYJrnp4F2U

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5E5	**Title**	**Batch:**	2026 - 2029
		Programming lab in AI and ML	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	2		**Credits:**	1

Course Objective

This course provides practical experience in AI and ML algorithms, including search, fuzzy logic, probabilistic reasoning, and machine learning models. Students will implement and analyze programs to solve real-world problems and make data-driven decisions.

Course Outcomes (CO)

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

CO Number	CO Statement	Knowledge Level
CO1	Recall the fundamentals of AI and ML algorithms, including BFS, A*, backtracking, fuzzy logic, probabilistic reasoning, MDPs, and neural networks.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain the working of search algorithms, fuzzy inference systems, Bayesian reasoning, Hidden Markov Models, utility theory, and clustering techniques.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Implement AI and ML algorithms in programs to solve problems like N-Queens, 8-puzzle, probability calculations, group decision making, and K-Means clustering.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO4	Analyze outputs of AI and ML programs to evaluate algorithm performance, infer patterns, and verify correctness of solutions.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate the effectiveness of implemented algorithms, compare different methods, and choose optimal strategies for decision-making, prediction, and data clustering.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

List of Programs:

1. Write a program to implement Breadth-First Search (BFS) to traverse a graph. Display the order in which nodes are visited starting from a given source node.
2. Write a program to solve a simple 8-puzzle problem using the A* search algorithm with a heuristic function.
3. Write a program to solve the N-Queens problem using backtracking. Display one valid arrangement of queens on the chessboard.
4. Write a program to generate the truth table for basic logical operations:
5. Write a program to implement a fuzzy membership function for temperature. Classify temperature into:
    Cold
    Warm
    Hot
6. Write a program to implement a simple fuzzy inference system for a fan speed controller using rules.
7. Write a program to calculate conditional probability using the formula:
$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$
8. Write a program to compute probability using Bayes' theorem for a simple medical diagnosis problem.
9. Write a program to simulate a simple Hidden Markov Model for weather prediction.
10. Write a program to calculate the expected utility of different choices and select the best decision.
11. Write a program to perform one iteration of value iteration for a simple MDP.
12. Write a program to simulate group decision making using majority voting.
13. Write a program to simulate:
    Binary distribution (e.g., coin toss)
    Multinomial distribution (e.g., rolling a dice multiple times)
14. Write a program to implement a simple feed-forward neural network with:
    One input layer
    One hidden layer
    One output
15. Write a program to implement K-Means clustering for a small dataset.

Text Books:

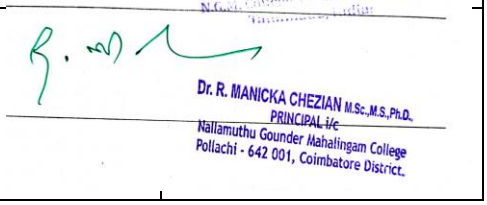
1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2014.
2. David Pool and Alan Mackworth, *Artificial Intelligence: Foundations of Computational agents*, Cambridge University Press, 2017.
3. Christopher M.Bishop, *Pattern Recognition and Machine Learning*, Springer, 2013.

Books for Reference:

1. C. S. Krishnamoorthy, S.. Rajeev, *Artificial Intelligence and Expert Systems for Engineers*,CRCPress, 1996.
2. Nils J. Nilsson, *The Quest for Artificial Intelligence: A History of Ideas and achievements*,Cambridge University press, 2010.
3. Alpaydin Ethem, *Introduction to Machine Learning*, Massachusetts Institute of Technology Press, 2009.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. **https://youtu.be/yaL5ZMvRRqE**
2. **https://youtu.be/ukzFI9rgwfU**

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS5E6	Title	Batch:	2026 - 2029
		Programming lab in R	Semester:	V
Lecture Hrs./Week or Practical Hrs./Week	2		Credits:	1

Course Objective

This course aims to provide hands-on experience in R programming, enabling students to write and execute programs using vectors, matrices, lists, and control structures. Students will learn to implement simple algorithms, manipulate data, and solve numerical and logical problems using R. It develops practical skills for data handling, analysis, and problem-solving in real-world scenarios.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall R commands, functions, and data structures required for basic programming tasks.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO2	Explain R concepts such as vectors, matrices, lists, sequences, and loops for problem-solving.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2)
CO3	Write R programs to implement algorithms for Fibonacci numbers, prime numbers, FizzBuzz, and other sequence/vector operations.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2)
CO4	Analyze R objects, vectors, and lists to extract, combine, and manipulate data effectively.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2)
CO5	Evaluate and validate R programs to ensure correct outputs for various computational and data handling problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

List of programs:

1. Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
2. Write a R program to get the details of the objects in memory.
3. Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
4. Write a R program to create a vector which contains 10 random integer values between -50 and +50.
5. Write a R program to get the first 10 Fibonacci numbers.
6. Write a R program to get all prime numbers up to a given number (based on the sieve of Eratosthenes).
7. Write a R program to print the numbers from 1 to 100 and print "Fizz" for multiples of 3, print "Buzz" for multiples of 5, and print "Fizz Buzz" for multiples of both.
8. Write a R program to extract first 10 English letters in lower case and last 10 letters in upper case and extract letters between 22nd to 24th letters in upper case.
9. Write a R program to find the maximum and the minimum value of a given vector.
10. Write a R program to get the unique elements of a given string and unique numbers of vector.
11. Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
12. Write a R program to create a list containing strings, numbers, vectors and a logical value.
13. Write a R program to create a list containing a vector, a matrix and a list and add element at the end of the list

Text Books:

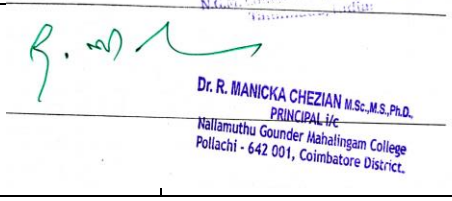
1. Paul Teetor, R Cookbook, O'Reilly Publications.
2. Norman Matloff, The Art of R Programming, No Starch Press.
3. Sandip Rakshit, R Programming for Beginners, Tata McGraw Hill.

Books for Reference:

1. Hadley Wickham and Garrett Grolemund, *R for Data Science*, O'Reilly Media, 2017.
2. Jared P. Lander, *R for Everyone*, Addison-Wesley Professional, 2014.
3. Tilman M. Davies, *The Book of R: A First Course in Programming and Statistics*, No Starch Press, 2016.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.coursera.org/learn/r-programming
2. https://www.datacamp.com/courses/free-introduction-to-r
3. https://cran.r-project.org/manuals.html

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5S1	**Title**	**Batch:**	2026 - 2029
		SEC III: **IIK:** Introduction to Vedic Mathematics	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	3		**Credits:**	2

Course Objective

The Learning Objectives of the course are:

- Discuss the rich heritage of mathematical temper of Ancient India
- Enhance computation skills in students through Vedic Mathematics
- Develop logical and analytical thinking
- Promote joyful learning of mathematics

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the basic concepts of Vedic Mathematics, including the 16 Vedic Sutras, Beejank, Vinculum numbers, and fundamental arithmetic principles.	PO1(3), PO2(1), PO3(1), PO4(1), PO8(1), PO11(1), PO15(1)
CO2	Understand the principles behind various Vedic techniques such as Nikhilam, Urdhva Thiryagbhyam, and Paravarthiya methods for arithmetic operations.	PO1(3), PO3(2), PO4(2), PO5(2), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Apply Vedic methods to perform multiplication, division, squaring, square roots, cubes, and cube roots of numbers and algebraic expressions.	PO1(3), PO3(2), PO4(3), PO5(3), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze arithmetic problems involving ratio, percentage, profit and loss, and interest using appropriate Vedic techniques.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(1), PO8(2), PO9(1), PO11(1), PO15(2)
CO5	Evaluate and choose suitable Vedic Mathematics techniques to solve complex numerical and real-life problems efficiently.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO8(2), PO9(2), PO10(2), PO11(2), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	–	–	–	1	–	–	1	–	–	–	1		
CO2	3	–	2	2	2	–	–	2	–	1	1	–	–	–	1		
CO3	3	–	2	3	3	–	–	2	–	1	1	–	–	–	2		
CO4	3	–	3	3	3	1	–	2	1	–	1	–	–	–	2		
CO5	3	–	3	3	3	2	–	2	2	2	2	–	–	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Introduction to Vedic Mathematics – 16 Vedic Sutras – Beejank and Vedic Check – Vinculam numbers – Multiplication by Nikhilam method 1, Nikhilam method 2, UrdhvaThiryagbhyam method (Vertically & Crosswise method)	9
Unit II	Squaring of numbers – Square root of numbers – Square and Square root of algebraic terms	9
Unit III	Cubes of numbers – Cube root of numbers	9
Unit IV	Division by Nikhilam method, Paravarthiya method, Straight Division method	9
Unit V	Arithmetic – Ratio – Rule of 3 – Percentage – profit & loss – simple & compound interest	9
	Total Contact Hrs.	**45**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

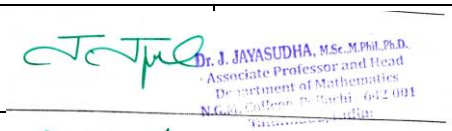
Chandrahas Halai, Vedic Mathematics Inside Out, The Write Place, Mumbai, 2018.

Books for Reference:

1. Rajesh Kumar Thakur, Advanced Vedic Mathematics,Rupa Publications India Pvt. Ltd, New Delhi.
2. Atrul Gupta, The Power of Vedic Maths, 2nd Edition, Jaico Publishing House, Mumbai.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. Bing Videos
2. Bing Videos

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5S2	**Title**	**Batch:**	2026 - 2029
		SEC III: **IIK:** History of Indian Mathematics (From Vedic period to Modern Era)	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	3		**Credits:**	2

Course Objective

1. Understand the Ancient Beginnings of Mathematics.
2. Grasp the Classical Period Contributions.
3. Realize the Vedic Period and Modern Developments.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the evolution of Mathematics and Vedic Mathematics, including key concepts such as Sutras, Sub-sutras, and the birth of zero.	PO1(3), PO2(1), PO3(1), PO4(1), PO8(1), PO11(1), PO15(1)
CO2	Understand the contributions of ancient Indian mathematicians such as Aryabhata, Brahmagupta, Bhaskara II, Madhava of Sangamagrama, and Srinivasa Ramanujan in the development of mathematics.	PO1(3), PO2(2), PO3(2), PO4(1), PO5(1), PO6(1), PO8(2), PO10(1), PO11(1), PO12(1), PO15(1)
CO3	Apply generalized approaches and Vedic techniques for finding higher-order roots and solving mathematical problems.	PO1(3), PO3(2), PO4(3), PO5(2), PO6(1), PO8(2), PO10(1), PO11(1), PO15(2)
CO4	Analyze ancient mathematical methods such as Sulbasutra algorithms and geometrical approaches, and compare them with modern computational techniques.	PO1(3), PO3(3), PO4(2), PO5(3), PO6(2), PO8(3), PO9(1), PO10(2), PO11(1), PO15(2)
CO5	Evaluate the role of Vedic Mathematics in modern applications including computer science, digital signal processing, and real-life problem solving.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(2), PO11(2), PO12(1), PO13(1), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	1	1	–	–	–	1	–	–	1	–	–	–	1		
CO2	3	2	2	1	1	1	–	2	–	1	1	1	–	–	1		
CO3	3	–	2	3	2	1	–	2	–	1	1	–	–	–	2		
CO4	3	–	3	2	3	2	–	3	1	2	1	–	–	–	2		
CO5	3	1	3	3	3	2	1	3	2	2	2	1	1	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Introduction of Mathematics -Evolution of Vedic Mathematics - Features of Vedic Mathematics - Importance of Vedic Mathematics - Sutras - Sub sutras.	9
Unit II	Baudhayana - Apastamba-yajnavalkya-panini-Aryabhatavarahamihira- Brahmagupta-Bhaskara- Mahavira Sridharacharya- Bhaskara-II- Madhava of Sangamagrama Nilakanthasomayaji – Jyeshtadeva – Parameshvara - Ramanujan.	9
Unit III	Birth of Zero - Mathematics in Vedas- A Generalized Approach for finding the Nth order roots of Numbers.	9
Unit IV	A Greedy Algorithm Hidden in Sulbasutra- Sankaras Geometrical Approach to Citrabhanus Ekavimsati Prasnottara.	9
Unit V	Vedic Mathematics in Modern Era - Vedic Mathematics in Computer: A survey -Vedic Mathematics- The cosmic software for implementation of fast Algorithms - Analysis of digital signal processing Algorithms based on Vedic Mathematics - Role of Vedic Mathematics in driving optimal solutions for Real Life Problems.	9
	Total Contact Hrs.	**45**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

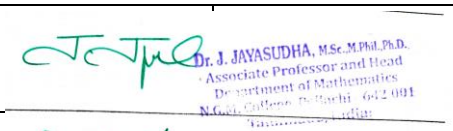
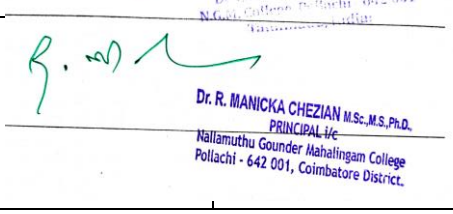
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Proceedings of the National Workshop on Ancient Indian Mathematics with special reference to Vedic Mathematics and Astronomy.Rashtriya Sanskrit Vidyapeetha 2011.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. NPTEL :: Mathematics - Mathematics in India - From Vedic Period to Modern Times
2. Bing Videos

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS5AL	**Title**	**Batch:**	2026 - 2029
		ALC I (OPTIONAL): ADVANCED OPERATIONS RESEARCH - I	**Semester:**	V
Lecture Hrs./Week or Practical Hrs./Week	-		**Credits:**	3*

Course Objective

The course aims to introduce some OR techniques like Integer programming, Gold programming, dynamic programming etc. to build capabilities in students for analyzing different business situations involving limited resources and obtained logical solutions.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall Linear programming techniques, understand and apply advanced techniques in linear programming and duality to real life problems	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO6(1), PO8(2), PO10(2), PO11(1)
CO2	Understand and solve variety of problems such as replacement problems, transportation problem etc.	PO1(3), PO2(1), PO3(2), PO4(3), PO5(3), PO6(1), PO8(2), PO10(2), PO11(1)
CO3	Sketch the theoretical workings of Integer programming, Goal programming, Dynamic programming problems and their solution procedures.	PO1(3), PO2(1), PO3(2), PO4(2), PO5(2), PO6(1), PO8(2), PO10(2), PO11(1)
CO4	Analyze any real system and formulate Mathematical models.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(2), PO11(2), PO13(1), PO14(1), PO15(2)
CO5	Make effective decisions under various business situations by applying appropriate optimization techniques.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(2), PO8(3), PO9(2), PO10(2), PO11(2), PO13(2), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	3	3	1	–	2	–	2	1	–	–	–	–		
CO2	3	1	2	3	3	1	–	2	–	2	1	–	–	–	–		
CO3	3	1	2	2	2	1	–	2	–	2	1	–	–	–	–		
CO4	3	1	3	3	3	2	1	3	2	2	2	–	1	1	2		
CO5	3	1	3	3	3	2	2	3	2	2	2	–	2	2	3		

3 Point Scale – 1, 2, 3

Units	Content
Unit I	**Duality in Linear Programming:** Economic Interpretation of Duality - Dual Simplex method. **LPP - Advanced Techniques:** Introduction - Revised Simplex Method - Bounded Variables. **Chapter 5: Sections: 5.8, 5.9.** **Chapter 9: Sections: 9.1, 9.2and 9.4.**
Unit II	**Integer Programming:** Introduction - Pure And Mixed Integer Programming Problems - Gomory's All-IPP Method - Construction of Gomory's constraint Fractional Cut Method - All Integer LPP, Fractional Cut Method - Mixed Integer LPP - Branch and Bound Method. **Chapter 7: Sections: 7.1 - 7.7.**
Unit III	**Goal Programming:** Introduction - Categorization of Goal Programming -Formulation of Linear Goal Programming Problem – Graphical Goal Attainment Method – Simplex Method for Goal Programming Problem. **Chapter 8: Sections: 8.1 - 8.5.**
Unit IV	**Dynamic Programming:** Introduction - The Recursive Equation Approach - Characteristics of Dynamic Programming - Dynamic Programming Algorithm. **Chapter 13: Sections: 13.1 - 13.4.**
Unit V	**Replacement problem and System Reliability:** Replacement of Equipment that fails suddenly - Recruitment and Promotion problem. **Transportation Problem:** Stepping Stone Solution Method - Time Minimization Transportation Problem - Transshipment Problems. **Chapter 18: 18.3 and 18.4.** **Chapter 10: 10.14, 10.16 and 10.17.**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

KantiSwarup, Gupta P.K. & Man Mohan, Operations Research (2014), Sultan Chand & Sons, New Delhi.

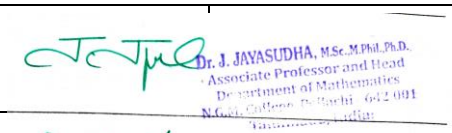
Books for Reference :

1. Philips T, Ravindran A and Solberg J, *Operations Research: Principles and Practice*, John Willey & Sons, 1976.
2. Taha H. A, *Operation Research - An introduction,* Prentice Hall of India Pvt. Ltd, New Delhi, 2006.
3. P. K Gupta &D. S Hira, Operations Research, S. Chand and company Ltd, New Delhi, 2014.

4. S. DharaniVenkatakrishnan, Operations Research principles problems, Keerthi Publishing house Pvt. Ltd.,1994.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.youtube.com/watch?v=xGkpXkAnWU&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=30
2. https://www.youtube.com/watch?v=h0bdo06qNVw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=33
3. https://www.youtube.com/watch?v=H58TPQNr2kM&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=34

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS614	Title	Batch:	2026 - 2029
		LINEAR ALGEBRA	Semester:	VI
Lecture Hrs./Week or Practical Hrs./Week	6		Credits:	5

Course Objective

To enable the students to study how to solve system of linear algebraic equations, basic concepts of an algebraic structure namely vector space and its properties of linear transformations on vector spaces and their relation between matrices.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall concepts of fields, matrices, systems of linear equations, vector spaces, and linear transformations.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2), PSO1(3), PSO2(2)
CO2	Explain the properties of vector spaces, subspaces, bases, dimension, and linear transformations, including isomorphisms.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2), PSO1(3), PSO2(2)
CO3	Apply matrix operations, row reduction, and representation of linear transformations to solve linear systems and problems in vector spaces.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2), PSO1(3), PSO2(3)
CO4	Analyze linear transformations using matrix representation, dual spaces, and transpose operations to understand structure and relationships.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2), PSO1(3), PSO2(3)
CO5	Evaluate the invertibility of matrices, isomorphisms, and the effects of transformations on vector spaces to verify theoretical results and solve complex problems.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3), PSO1(3), PSO2(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2		
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2		
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2		
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2		
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Linear Equations:** Fields - Systems of Linear Equations - Matrices and Elementary Row Operations- Row Reduced Echelon Matrices -*Matrix Multiplication (Self study)* – Invertible Matrices. **Chapter 1: Sections: 1.1 - 1.6.**	18
Unit II	**Vector Spaces:** Vector Spaces - Subspaces - Bases and Dimension - Coordinates - *Summary of Row Equivalence (Self study)*. **Chapter 2: Sections: 2.1 - 2.5.**	18
Unit III	**Linear Transformations:** Linear transformations - The Algebra of Linear Transformations - Isomorphism. **Chapter 3: Sections: 3.1 - 3.3**.	18
Unit IV	**Linear Transformation:** Representation of Transformations by Matrices - Linear Functionals. **Chapter 3: Sections: 3.4, 3.5**.	18
Unit V	**Linear Transformation:** The Double Dual - The Transpose of a Linear Transformation. **Chapter 3: Sections: 3.6, 3.7**.	18
	Total Contact Hrs.	**90**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Kenneth Hoffman and Ray Kunze, Linear *Algebra*, Second Edition, PHI Learning Pvt. Ltd, New Delhi, 2013.

Books for Reference:

1. Herstein I. N, *Topics in algebra*, Vikas Publishing House Pvt. Ltd, 1981.
2. Kumaresan S, *Linear Algebra*, Prentice Hall of India, 2001.
3. Seymour Lipschutz and Marc Lipson, *Linear Algebra*, Tata McGraw Hill,3rd Edition, 2001.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/105/111105112/
2. https://nptel.ac.in/courses/111/106/111106051/

Course Designed by	Dr. M. MAHESWARI	M.Malleli
Verified by HoD	Dr. J. JAYASUDHA	Dr. J. JAYASUDHA, M.Sc.,M.Phil.,Ph.D. Associate Professor and Head Department of Mathematics
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	Dr. R. MANICKA CHEZIAN M.Sc.,M.S.,Ph.D. PRINCIPAL i/c Nallamuthu Gounder Mahalingam College Pollachi - 642 001, Coimbatore District.

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS615	**Title**	**Batch:**	2026 - 2029
		REAL ANALYSIS – II	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	6		**Credits:**	5

Course Objective

To equip the students for study in Real analysis by introducing further some of advanced topics in Real Analysis.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Understand and explain fundamental concepts of derivatives, functions of bounded variation, and Riemann–Stieltjes integrals.	PO1(3), PO2(1), PO3(2), PO4(1), PO6(1)
CO2	Apply differentiation rules, properties of monotonic and bounded variation functions, and integration techniques to solve mathematical problems.	PO1(3), PO3(3), PO4(3), PO5(2), PO6(1), PO8(2), PO9(2), PO11(1), PO15(2)
CO3	Analyze the behavior of functions using theorems such as Rolle's theorem, Mean Value Theorem, and conditions for integrability in the Riemann–Stieltjes sense.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO10(2), PO11(2), PO15(1)
CO4	Evaluate integrals and investigate properties of Riemann–Stieltjes integrals, including existence conditions, comparison theorems, and mean value theorems.	PO1(3), PO2(1), PO3(2), PO4(2), PO5(2), PO6(3), PO8(3), PO9(1), PO10(2), PO11(2), PO13(1), PO15(2)
CO5	Utilize appropriate digital and mathematical tools to visualize derivatives, variations, and integrals, and to model and solve advanced problems in real analysisand demonstrate how abstract ideas in real analysis can be applied to practical problems.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(1), PO10(3), PO11(3), PO12(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PS O1	PS O2
CO1	3	1	2	1	-	1	-	-	-	-	-	-	-	-	-		
CO2	3	-	3	3	2	1	-	2	2	-	1	-	-	-	2		
CO3	3	-	3	3	3	2	-	3	-	2	2	-	-	-	**1**		
CO4	3	1	2	2	2	3	-	3	1	2	2	-	1	-	2		
CO5	3	2	3	3	3	2	-	3	1	3	3	1	-	-	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Derivatives:** Introduction - Definition of derivative – Derivatives and continuity - Algebra of Derivatives – The chain rule – One sided Derivatives and infinite derivatives -Functions with nonzero derivative – Zero derivatives and local extrema - Rolle's theorem - The Mean Value Theorem for derivatives –Intermediate value theorem for derivatives - Taylor's formula with remainder. **Chapter 5 : Sections: 5.1 - 5.12.**	18
Unit II	**Functions of Bounded Variations**: Introduction - Properties of monotonic functions - Functions of bounded variations - Total variations - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of increasing functions - Continuous functions of bounded variation. **Chapter 6 : Sections: 6.1 - 6.8.**	18
Unit III	**The Riemann-Stieltjes Integral**: Introduction - Notation - The definition of Riemann-Stieltjes Integral - Linear properties - Integration by parts - Change of variable in Riemann-Stieltjes integral - Reduction to a Riemann integral - Step functions as integrators - Reduction of a Riemann-Stieltjes integral to a finite sum - Euler's summation formula. **Chapter 7 :Sections: 7.1 - 7.10**	18
Unit IV	**The Riemann-Stieltjes Integral**: Monotonically increasing integrators - Upper and lower integrals - Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems - Integrators of bounded variation - Sufficient conditions for existence of Riemann-Stieltjes integrals - Necessary conditions for existence of Riemann-Stieltjes integrals. **Chapter 7 : Sections: 7.11 - 7.17.**	18
Unit V	**The Riemann-Stieltjes Integral**: Mean Value Theorems for Riemann-Stieltjes Integrals - The integral as a function of the interval - Second fundamental theorem of integral calculus - Change of variable in a Riemann integral - Second Mean-Value Theorem for Riemann integrals. **Chapter 7 : Sections: 7.18 - 7.22**.	18
	Total Contact Hrs.	90

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

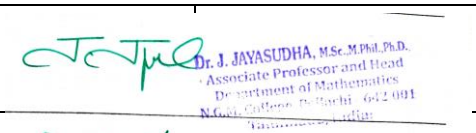
Tom M. Apostal, *Mathematical Analysis*, Narosa Publishing House, Second Edition 2002.

Books for Reference:

1. Goldberg R. R, *Methods of Real Analysis*, Oxford and IBH Publishing Co., 1973.
2. Soma Sundaram D, Choudhary B, *A first course in Mathematical Analysis*,Narosa Publishing House, 1996.
3. Walter Rudin, *Principles of Mathematical Analysis*, McGraw Hill Inc, Third Edition, 1976.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2012/
2. https://cosmolearning.org/courses/real-analysis-with-prof-sh-kulkarni/

Course Designed by	Dr. S. KALEESWARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS616	Title	Batch:	2026 - 2029
		OPERATIONS RESEARCH	Semester:	VI
Lecture Hrs./Week or Practical Hrs./Week	5		Credits:	4

Course Objective

The course aims to provide a comprehensive understanding of optimization techniques, including the formulation and solution of Linear Programming Problems using graphical and simplex methods, along with duality concepts. It also focuses on developing the ability to apply transportation and assignment models for real-life decision-making situations. Further, the course introduces queuing theory and network scheduling techniques such as PERT/CPM to analyze system performance and support effective planning and management.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Understand the fundamental concepts of optimization including Linear Programming Problems (formulation, graphical methods, simplex method), duality, transportation, assignment, queuing models, and network scheduling techniques.	PO1(3), PO3(2), PO4(2), PO5(2), PO8(2), PO11(1), PO15(1)
CO2	Apply appropriate optimization techniques such as simplex method, transportation and assignment methods, and basic queuing and network models to solve real-life problems.	PO1(3), PO3(2), PO4(3), PO5(2), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Analyze optimization problems by interpreting primal-dual relationships, degeneracy, optimality conditions, and system performance measures in queuing and network models.	PO1(3), PO3(3), PO4(2), PO5(3), PO6(1), PO8(2), PO9(1), PO11(1), PO15(1)
CO4	Analyze and compare different optimization methods (LPP, transportation, assignment, queuing, PERT/CPM) to determine suitable approaches for various practical situations.	PO1(3), PO3(2), PO4(3), PO5(3), PO7(1), PO8(2), PO10(1), PO11(1), PO15(1)
CO5	Evaluate and select the most appropriate operations research techniques for decision-making in complex real-world systems.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(2), PO9(2), PO10(1), PO11(2), PO14(1), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	2	2	2	–	–	2	–	–	1	–	–	–	1		
CO2	3	–	2	3	2	–	–	2	–	1	1	–	–	–	1		
CO3	3	–	3	2	3	1	–	2	1	–	1	–	–	–	1		
CO4	3	–	2	3	3	–	1	2	–	1	1	–	–	–	1		
CO5	3	–	3	3	3	2	1	2	2	1	2	–	–	1	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Linear Programming Problem: Mathematical formulation:** Introduction - Linear Programming Problem - Mathematical Formulation of the Problem – illustration on Mathematical formulation of LPP's. **Linear Programming Problem: Graphical Solution and Extension:** Introduction - Graphical Solution Method –Some exceptional cases - General Linear Programming Problem - Canonical and Standard Forms of L.P.P. **Linear Programming Problem: Simplex Method:** Introduction - The Computational Procedure **Chapter 2: Sections: 2.1 - 2.4** **Chapter 3: Sections: 3.1 - 3.5** **Chapter 4: Sections: 4.1, 4.3**	15
Unit II	**Linear Programming Problem: Simplex Method:** Use of Artificial Variables- Degeneracy in Linear Programming - Applications of Simplex Method. **Duality in Linear Programming:** Introduction – General Primal-Dual pair – Formulating a Dual problem - Primal-Dual pair in Matrix form- Duality Theorems – Duality and Simplex Method . **Chapter 4: Sections: 4.4 - 4.5.(Excluding Two-phase method in 4.4.)** **Chapter 5: Sections: 5.1 – 5.4, 5.5, 5.7.**	15
Unit III	**Transportation Problem:** LP formulation of the Transportation Problem - Existence of Solution in TP - The Transportation Table - Loops in Transportation Tables - Finding an initial basic feasible solution - North West corner rule - Least cost Method - Vogel's approximation Method (Self Study) -Test for Optimality - Determining the Net evaluations (The uv method) - Transportation algorithm (MODI Method) - Some exceptional cases - Unbalanced Transportation Problem. **Chapter 10: Sections: 10.2, 10.3, 10.5, 10.6, 10.9, 10.10, 10.13, 10.15.** **Assignment Problem:** Introduction - Mathematical Formulation of the Assignment Problem - Solution of Assignment Problem –Hungarian Assignment Method - Special cases in Assignment Problems. **Chapter 11: Sections: 11.1- 11.3, 11.4.**	15
Unit IV	**Queuing Theory**: Introduction- Queuing System - Elements of a Queuing System - Operating characteristics of a Queuing system - Classification of Queuing Models – Definition of Transient and Steady States - Poisson Queuing System Model I : (M/M/ 1): (∞/FIFO) Model III : (M/M/ 1): (N/FIFO) Model V : (M/M/ C): (∞/FIFO) *Model VI : (M/M/ C): (N/FIFO)(Self study)* - Simple Problems. **Chapter 21: Sections: 21.1 - 21.4, 21.7, 21.8, 21.9.**	15
Unit V	**Network scheduling by PERT/CPM**: Network: Basic compounds - Logical Sequencing - Rules of Network constructions – Concurrent Activities- *Critical Path Method (CPM) (Self study)* - Probability considerations in PERT - Distinction between PERT & CPM - Simple Problems. **Chapter 25: Sections: 25.1 - 25.8.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

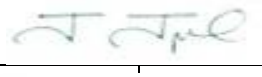
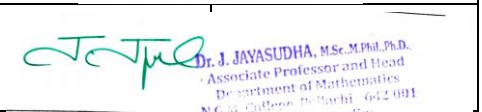
Kanti Swarup, Gupta P. K and Man Mohan, Operations Research, Sultan Chand & Sons, New Delhi, 2014.

Books for Reference:

1. Phillips T, Ravindran A and Solberg J, Operations Research: Principles and Practice, John Willey & Sons, 1976.
2. Taha H. A, Operation Research - An introduction, Prentice Hall of India Pvt Ltd, New Delhi, 2006.
3. P. K Gupta &D. S Hira, Operations Research, S. Chand and company Ltd, New Delhi, 2014.
4. S. Dharani Venkatakrishnan, Operations Research principles problems, Keerthi Publishing house Pvt. Ltd.,1994.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.youtube.com/watch?v=H58TPQNr2kM&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=34
2. https://youtu.be/Q31jKiEXxdc
3. https://youtu.be/BUGIhEecipE

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS6E5	**Title**	**Batch:**	2026 - 2029
		THEORY OF NUMBERS	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	5

Course Objective

This course exposes the elementary basic theory of numbers and several famous functions, related theorems and some unsolved problems about primes to the students in order to enable them to deeper their understanding of the subject.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Demonstrate disciplinary knowledge of complex functions, integrals, sequences, series and fundamental theorems across all five units.	PO1(3), PO2(1), PO5(2), PO8(2), PO10(1), PO11(1), PO15(2)
CO2	Apply concepts, critical thinking, and problem-solving skills to solve integrals, line integrals and problems in conformal mapping.	PO1(2), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO10(2), PO11(1), PO15(2)
CO3	Utilize digital and mathematical tools, software, and models; engage in self-directed learning through online courses, research articles and seminars to enhance lifelong learning.	PO1(2), PO2(1), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO10(3), PO11(1), PO15(3)
CO4	Analyze functions, sequences, series, singularities and integrals to draw logical and mathematical conclusions.	PO1(2), PO2(1), PO3(2), PO4(3), PO5(3), PO6(3), PO8(3), PO10(2), PO11(2), PO15(3)
CO5	Create, design and evaluate solutions for complex analysis problems, including proofs, mappings and local properties of functions.	PO1(2), PO2(1), PO3(2), PO4(3), PO5(3), PO6(3), PO8(3), PO10(3), PO11(3), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	–	–	2	–	–	2	–	1	1	–	–	–	2		
CO2	2	1	3	3	3	2	–	3	–	2	1	–	–	–	2		
CO3	2	1	3	3	3	3	–	3	–	3	1	–	–	–	3		
CO4	2	1	2	3	3	3	–	3	–	2	2	–	–	–	3		
CO5	2	1	2	3	3	3	–	3	–	3	3	–	–	–	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Basic Representation**: Principles of Mathematical Induction - The Basis Representation Theorem. **The Fundamental Theorem of Arithmetic:** Euclid's Division Lemma - Divisibility - The Linear Diophantine Equation. **Chapter 1: Sections: 1.1 -1. 2.** **Chapter 2: Sections: 2.1 -2. 3.**	15
Unit II	**Combinational and Computational Number Theory**: Permutations and Combinations - Fermat's Little Theorem (Statement only) - Wilson's Theorem (Statement only) – Generating Functions. **Fundamentals of Congruence's:** *Basic Properties of Congruence's (Self study).* **Chapter 3: Sections: 3.1 - 3.4.** **Chapter 4: Sections: 4.1.**	15
Unit III	**Solving Congruences**: Linear Congruences - The Theorems of Fermat and Wilson Revisited - The Chinese Remainder Theorem - *Polynomial Congruences (Self study).* **Chapter 5: Sections: 5.1-5.4.**	15
Unit IV	**Arithmetic Functions**: Combinatorial Study of $\Phi(n)$ - Formulae For d(n) and $\sigma(n)$ - Multiplicative Arithmetic Functions - The Mobius Inversion Formula. **Chapter 6: Sections: 6.1-6.4.**	15
Unit V	**Primitive Roots**: Primitive Roots Modulo P. **Prime Numbers:** Elementary Properties of $\pi(x)$ - Tchebyshev's Theorem - Some Unsolved Problems About Primes. **Chapter 7: Sections: 7.2.** **Chapter 8:Sections: 8.1-8.3.**	12
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

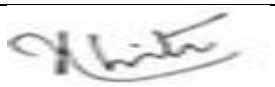
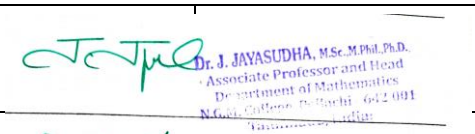
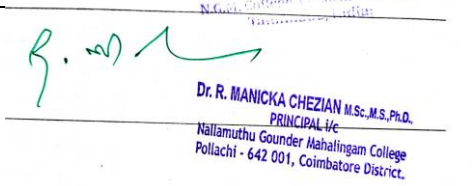
George E. Andrews, *Number Theory*, HPS (India), 1992.

Books for Reference:

1. David M. Burten, *Elementary Number Theory*, McGraw- Hill edition, 2010.
2. Kumaravelu et al., *Elements of Number Theory*, Nagerkovil, SKV, 2002.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/101/111101137/
2. https://nptel.ac.in/courses/111/103/111103020/

Course Designed by	Dr. V. CHITRA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS6E6	**Title**	**Batch:**	2026 - 2029
		FUZZY SET THEORY	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	5

Course Objective

To enable the learners to obtain basic knowledge in fuzzy set theory.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Define and recall fundamental concepts of crisp sets and fuzzy sets, including terminology such as membership functions, α-cuts, and basic set operations.	PO1(3), PO2(1), PO8(1), PO11(1), PO15(1)
CO2	Explain the paradigm shift from crisp sets to fuzzy sets and describe the basic types, properties, and significance of fuzzy set theory in handling uncertainty.	PO1(3), PO2(2), PO3(1), PO8(2), PO11(1), PO15(1)
CO3	Apply concepts of fuzzy sets, including α-cuts, representation methods, and the extension principle, to solve problems involving imprecise data and set relationships.	PO1(3), PO2(2), PO3(2), PO4(2), PO5(2), PO6(1), PO8(2), PO10(1), PO11(2), PO12(1), PO15(2)
CO4	Analyze differences between crisp and fuzzy sets and evaluate additional properties of α-cuts and various representations to interpret real-world scenarios.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(3), PO6(1), PO8(3), PO9(1), PO10(1), PO11(2), PO15(2)
CO5	Evaluate and compare different operations on fuzzy sets such as fuzzy complements, intersections (t-norms), unions (t-conorms), and aggregation operators to determine appropriate methods for decision-making problems.	PO1(2), PO2(2), PO3(3), PO4(3), PO5(2), PO6(2), PO7(1), PO8(3), PO9(1), PO10(2), PO11(2), PO13(1), PO14(1), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	1	-	-	1	-	-	-	1		
CO2	3	2	1	-	-	-	-	2	-	-	1	-	-	-	1		
CO3	3	2	2	2	2	1	-	2	-	1	2	1	-	-	2		
CO4	3	2	3	2	3	1	-	3	1	1	2	-	-	-	2		
CO5	2	2	3	3	2	2	1	3	1	2	2	-	1	1	3		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**From Classical(crisp) sets to fuzzy sets:** A Ground Paradigm shift-Introduction-Crisp sets: An overview.	15
Unit II	Fuzzy sets: Basic types-Basic concepts-Characteristic and significance of the paradigm shift.	15
Unit III	**Fuzzy sets versus Crisp sets:** Additional properties of α-cuts-Representations of Fuzzy sets-Extension Principle for Fuzzy sets.	15
Unit IV	**Operations on Fuzzy sets:** Types of operations-Fuzzy complements-Fuzzy intersections: t-Norms.	15
Unit V	**Fuzzy Unions:** t-Conorms-Combinations of operations-Aggregation operations.	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

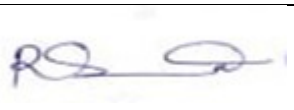
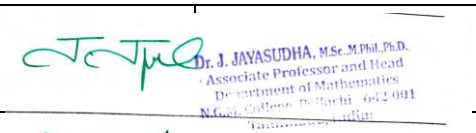
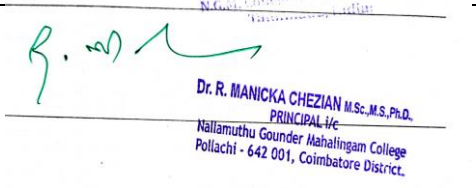
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic(Theory and Applications), Prentice Hall of India Private Limited, New Delhi, 2000.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in/courses/111/107/111107103/
2. https://nptel.ac.in/courses/111/104/111104025/

Course Designed by	Dr. R. SANTHI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS6E7	**Title**	**Batch:**	2026 - 2029
		AUTOMATA THEORY AND FORMAL LANGUAGES	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	5

Course Objective

To impart knowledge in Finite automata, regular languages, regular grammars, Context free grammars, languages, and pushdown automata which play a crucial role to Identify different formal language classes and their relationship.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the basic concepts of phrase structure languages, context-free languages, finite state automata, and pushdown automata.	PO1(3), PO3(1), PO4(1), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2), PSO1(3), PSO2(2)
CO2	Explain the properties, structure, and operations of formal languages and automata.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(2), PO8(2), PO10(2), PO11(2), PO15(2), PSO1(3), PSO2(2)
CO3	Apply theoretical concepts to design finite state automata and pushdown automata for given languages.	PO1(3), PO3(3), PO4(3), PO5(3), PO8(3), PO9(1), PO10(3), PO11(2), PO15(2), PSO1(3), PSO2(3)
CO4	Analyze the structure of formal languages and automata to determine language recognition and derivations.	PO1(3), PO3(3), PO4(3), PO5(3), PO6(3), PO8(3), PO9(2), PO10(3), PO11(2), PO15(2), PSO1(3), PSO2(3)
CO5	Evaluate computational models and language classifications to justify correctness and efficiency of automata designs.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO8(3), PO9(2), PO10(3), PO11(3), PO13(1), PO14(2), PO15(3), PSO1(3), PSO2(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	1	2	–	–	2	–	2	2	–	–	–	2	3	2
CO2	3	2	3	3	2	–	–	2	–	2	2	–	–	–	2	3	2
CO3	3	–	3	3	3	–	–	3	1	3	2	–	–	–	2	3	3
CO4	3	–	3	3	3	3	–	3	2	3	2	–	–	–	2	3	3
CO5	3	1	3	3	3	2	–	3	2	3	3	–	1	2	3	3	3

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Phrase structure languages:** Introduction – phrase structure languages.	15
Unit II	**Closure operations:** Closure operations.	15
Unit III	**Context free languages:** Context free languages	15
Unit IV	**Finite state automata:** Finite state automata	15
Unit V	**Push down automata:** Push down automata.	15
	Total Contact Hrs.	75

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

Formal Languages and Automata- Rani Siromoney. (Revised edition 1984) (Published by the Christian Literary Society, Madras-3) Chapters 1 to 6.

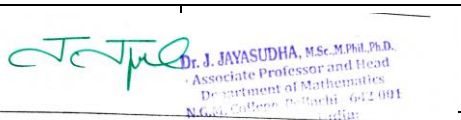
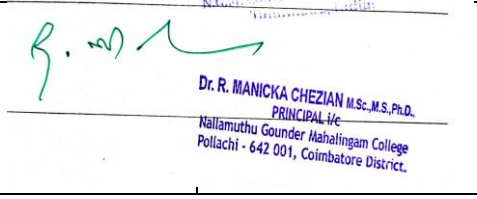
Books for Reference:

1. Formal languages and their relation automata- J.E. Hopcroft and D.Ullman (Addison Wesley1969).

2. Automata theory: Machines and Languages -Richard .Y.Kain (McGraw Hill1972).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

https://www.youtube.com/watch?v=LN9BLhJ92vg

Course Designed by	Dr. R. SANTHI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS6E8	Title	Batch:	2026 - 2029
		DISCRETE MATHEMATICS	Semester:	VI
Lecture Hrs./Week or Practical Hrs./Week	5		Credits:	4

Course Objective

In this course a set of topics that are of genuine use in computer science and elsewhere are identified and combined together in a logically coherent fashion, to enable the students to get a good training in these topics which will inevitably lead the students in the direction of clear thinking, sound reasoning and a proper attitude towards the applications of Mathematics in computer science and other related fields.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recollect the fundamental concepts of recurrence relations, generating functions, propositional logic, lattices, Boolean algebra, graph theory, and formal languages and automata.	PO1(3), PO3(1), PO8(1)
CO2	Understand the principles of recurrence relations, logical equivalences, normal forms, lattice structures, properties of graphs, and the basics of formal languages and finite automata.	PO1(3), PO2(1), PO3(2), PO5(1), PO8(2)
CO3	Apply appropriate methods to solve recurrence relations, construct truth tables and normal forms, analyze lattice and Boolean algebra structures, and solve problems in graph theory and automata.	PO1(2), PO2(1), PO3(2), PO4(3), PO5(2), PO8(2), PO10(1), PO11(1)
CO4	Analyze logical expressions, recurrence relations, graph structures, and automata models to determine their properties, equivalence, and structural behavior.	PO1(2), PO2(1), PO3(3), PO4(2), PO5(3), PO6(1), PO8(3), PO9(1), PO11(1)
CO5	Evaluate and justify solutions of complex problems involving recurrence relations, logical systems, graph theory, and automata, and interpret their applications in computing and mathematical contexts.	PO1(2), PO2(2), PO3(3), PO4(3), PO5(3), PO6(1), PO8(3), PO9(1), PO10(1), PO11(2), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	–	1	–	–	–	–	1	–	–	–	–	–	–	–		
CO2	3	1	2	–	1	–	–	2	–	–	–	–	–	–	–		
CO3	2	1	2	3	2	–	–	2	–	1	1	–	–	–	–		
CO4	2	1	3	2	3	1	–	3	1	–	1	–	–	–	–		
CO5	2	2	3	3	3	1	–	3	1	1	2	–	–	–	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	**Recurrence Relations and Generating functions**: Recurrence - An Introduction - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite order Homogeneous (linear) Relations - Solution of Non-Homogeneous Relations - Generating Functions - *Some Common Recurrence Relations(self Study).* **Text Book 1: Chapter 5: Sections: 1 - 7.**	15
Unit II	**Logic**: Tautology - Tautological Implications and Equivalence of Formulae - Replacement Process - Functionally Complete Sets of Connectives and Duality Law - Normal Forms - Principle Normal Forms. **Text Book 1: Chapter 9: Sections: 7 - 12**.	15
Unit III	**Lattices and Boolean Algebra**: Lattices - Some Properties of Lattices - New Lattices - Modular and Distributive Lattices - Boolean Algebras **Text Book 1: Chapter 10: Sections: 1 - 5.**	15
Unit IV	**Graph Theory:** Introduction - Basic Terminology - Paths, Cycles and Connectivity – Sub graphs - Types of Graphs - Isomorpic Graphs - Homeomorphic Graphs - Eulerian and Hamiltonian Graphs. **Text Book 2: Chapter 9: Sections: 9.1 - 9.7 and 9.9.**	15
Unit V	**Language , Grammar and Automata**: Introduction - Language - The Set Theory of Strings - Languages - Regular Expressions and Regular Languages - Grammar - Finite-State Machine - Finite State Automata. **Text Book 2: Chapter 15: Sections: 15.1 - 15.7.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

1. Venkataraman M. K, Sridharan N and Chandrasekaran N, *Discrete Mathematics,*The National Publishing Company, 2000.
2. Sharma J. K, *Discrete Mathematics*, Macmillan Publishers India Ltd, 2011.

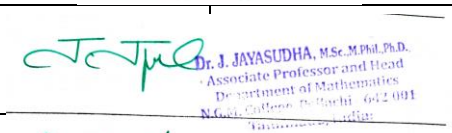
Books for Reference:

1. Ralph P.Grimaldi, *Discrete and Combinatoral Mathematics - An applied introduction,*

Third Edition, Addison Wesley Publishing Company, 1994.
2. Tremblay J. P and Manohar R, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill, 2001.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/111/106/111106086/
2. https://nptel.ac.in/courses/111/107/111107058/

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	Programme Title:	B.Sc. Mathematics	
Course Code:	26UMS6E9	Title	Batch:	2026 - 2029
		GRAPH THEORY	Semester:	VI
Lecture Hrs./Week or Practical Hrs./Week	5		Credits:	4

Course Objective

Graph theory is a major area of Combinatorics. In this Course we introduce the learners to some basic topics in graph theory.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall and define basic concepts of graphs, including types of graphs, walks, connectedness, degrees, and operations on graphs.	PO1(3), PO2(1), PO3(1), PO5(2), PO8(2), PO10(2)
CO2	Explain graph representations using adjacency and incidence matrices and interpret their significance in analyzing graph structures.	PO1(3), PO2(2), PO3(2), PO4(1), PO5(2), PO8(2), PO9(1), PO10(2), PO11(1)
CO3	Apply concepts of trees, cut points, bridges, blocks, and block-cut point trees to solve problems related to graph connectivity and structure.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(1), PO7(2), PO8(3), PO9(2), PO10(2), PO11(2), PO13(1), PO14(1), PO15(2)
CO4	Analyze traversability, Eulerian and Hamiltonian graphs, and connectivity properties to determine graph characteristics.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(2), PO8(3), PO9(2), PO10(2), PO11(2), PO13(1), PO14(1), PO15(2)
CO5	Evaluate planar graphs, graph coloring, chromatic numbers, and directed graphs to determine optimal solutions and validate graph properties.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(2), PO8(3), PO9(2), PO10(2), PO11(2), PO13(2), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3	1	1	–	2	–	–	2	–	2	–	–	–	–	–
CO2	3	2	2	1	2	–	–	2	1	2	1	–	–	–	–
CO3	3	1	3	3	3	1	2	3	2	2	2	–	1	1	2
CO4	3	1	3	3	3	2	2	3	2	2	2	–	1	1	2
CO5	3	1	3	3	3	2	2	3	2	2	2	–	2	2	3

3 Point Scale – 1, 2, 3

Units	Contents	Hrs.
Unit-I	**Graphs:** Varieties of graphs - Walks and connectedness - Degrees - Operation on Graphs. **Matrices:** The adjacency matrix - The incidence Matrix. **Chapter 2 : Sections 2.1 – 2.3, 2.7** **Chapter 13 : Sections 13.1, 13.2**	15
Unit-II	**Blocks:** Cut points - bridges and blocks - Block graphs and cut point graphs. **Trees:** Characterization of trees - Centers and centroids. **Chapter 3 : Sections 3.1, 3.2** **Chapter 4 : Sections 4.1, 4.2**	15
Unit-III	**Trees:** Block-cut point trees – Independent cycles and cocycles **Connectivity:** Connectivity and line-connectivity. **Traversibility:** Euelerian graphs. **Chapter 4 : Sections 4.3, 4.4** **Chapter 5 : Sections 5.1** **Chapter 7 : Sections 7.1**	15
Unit-IV	**Traversibility:** Hamiltonian graphs. **Planarity:** Plane and planar graphs- Outer planar graphs. **Chapter 7 : Sections 7.2** **Chapter 11 : Sections 11.1, 11.2**	15
Unit-V	**Colorability:** The Chromatic number – The five color theorem. **Digraphs:** Digraphs and connectedness – Digraphs and matrices. **Chapter 12 : Sections 12.1, 12.2** **Chapter 16 : Sections 16.1, 16.3.**	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

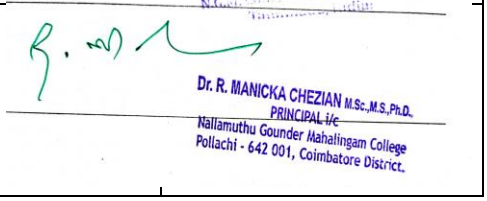
Frank Harary. (2001). *Graph Theory.* Narosha Publishing.

Books for Reference:

1. Balakrishnan, R. and Ranganathan. K. (2000).*A Text Book on Graph Theory.*New York: Springer Verlog.
2. Gould, R. (1988). *Graph Theory*, California: The Benjamin/ Cummings Publishing Company, Inc.
3. Hartsfield, N. and Ringel, G.(1990) *Pearls in Graph Theory*, Academic Press.
4. Bondy, J.A. and MurtyU.S.R. (1976) *Graph Theory with Applications*, Macmillan Company.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://youtu.be/1h2BoCtobXw
2. https://youtu.be/R9R9hhue614

Course Designed by	Dr. S. SIVASANKAR	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS6E10	**Title**	**Batch:**	2026 - 2029
		MATHEMATICS IN FINANCE	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	5		**Credits:**	4

Course Objective

The objective of this paper is to introduce the concepts of financial statement analysis which help the students to develop their financial skills.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the meaning, objectives, and concepts of financial statement analysis and ratio analysis.	PO1(3), PO2(1), PO8(1), PO11(1), PO15(1)
CO2	Explain the types of ratios **such as** liquidity, leverage, profitability, and activity ratios and their significance.	PO1(3), PO2(2), PO3(1), PO5(1), PO8(1), PO11(1), PO15(1)
CO3	Apply ratio analysis techniques to compute and interpret financial performance, including ROI and profitability ratios related to sales and investments.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(2), PO6(1), PO7(1), PO8(2), PO10(1), PO11(2), PO13(1), PO14(1), PO15(2)
CO4	Analyze financial statements and assess the importance and limitations of ratio analysis in evaluating business performance.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(1), PO11(2), PO13(1), PO14(1), PO15(2)
CO5	Evaluate capital budgeting decisions using cash flow estimation and appraisal techniques such as NPV and IRR methods.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(1), PO11(3), PO13(2), PO14(2), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	1	-	-	1	-	-	-	1		
CO2	3	2	1	-	1	-	-	1	-	-	1	-	-	-	1		
CO3	3	2	3	2	2	1	1	2	-	1	2	-	1	1	2		
CO4	3	2	3	3	3	2	1	3	1	1	2	-	1	1	2		
CO5	3	2	3	3	3	2	1	3	1	1	3	-	2	2	2		

3 Point Scale – 1, 2, 3

Units	Contents	Hrs.
Unit-I	**Financial statement Analysis:** Ratio Analysis: Meaning and Objectives of financial statement analysis – Ratio analysis – Types of ratios – Liquidity ratios.	15
Unit-II	Leverage/Capital structure ratios – Profitability ratios – Profitability ratios related to sales – Profitability ratios related to investments – Return on Investments (ROI).	15
Unit-III	Activity ratios – Importance of ratio analysis – Meaning of Capital budgeting – Rationale of Capital Expenditure.	15
Unit-IV	Kinds of Capital budgeting decisions – Data Requirement – Identifying relevant cash flows - Cash outflow estimates – Cash inflow estimates.	15
Unit-V	**Capital budgeting:** Methods of Appraisal: Traditional Techniques – Discounted cash flow or time adjusted techniques – NPV and IRR methods.	15
	Total Contact Hrs.	**75**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

M. Y. Khan and P. K. Jain, Financial Management, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1990.

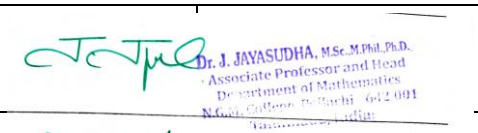
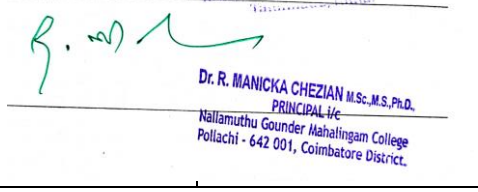
Books for Reference:

1. AswathDamodaran, Corporate Finance – Theory and Practice, John Wiley and Sons, Inc.

2. Prasanna Chandra, Managing Investments, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1998.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Bing Videos
2. Bing Videos

Course Designed by	Dr. A. GNANASOUNDARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS617	**Title**	**Batch:**	2026- 2029
		PROJECT	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	-		**Credits:**	4

Components of the Project may be included the following

Review No.	**Activity**
I	Problem Identification and Related Literature collection
II	Analyzing or solving problems by applying different methodology
III	Giving conclusion

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS6S1	**Title**	**Batch:**	2026 - 2029
		SEC IV: **Naan Mudhalvan:** STATISTICS WITH EXCEL	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	2 (1+1 Lab)		**Credits:**	1

Course Objective

To learn and acquire the knowledge of Statistics using Excel Programming

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the basic concepts of data, types of data, and frequency distributions, including relative and cumulative frequencies.	PO1(3), PO2(1), PO8(1), PO11(1), PO15(1)
CO2	Explain graphical representations such as histograms, bar charts, pie charts, frequency polygons, scatterplots, and time-series graphs, and describe distribution shapes and skewness.	PO1(3), PO2(2), PO3(2), PO4(1), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Construct frequency distributions and graphical charts using tools like Excel and XLSTAT, and compute the correlation coefficient**.**	PO1(3), PO2(2), PO3(3), PO4(2), PO5(2), PO6(1), PO7(1), PO8(2), PO10(3), PO11(2), PO13(1), PO14(1), PO15(2)
CO4	Analyze data using graphs and distribution patterns, including normal distribution, skewness, and trend analysis from time-series and scatterplots.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(2), PO11(2), PO13(1), PO14(1), PO15(2)
CO5	Evaluate datasets using descriptive statistics such as mean, median, mode, midrange, and weighted mean, and interpret results for decision-making.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(2), PO11(3), PO13(2), PO14(2), PO15(2)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	1	-	-	1	-	-	-	1		
CO2	3	2	2	-	1	-	-	2	-	1	1	-	-	-	1		
CO3	3	2	3	2	2	1	1	2	-	3	2	-	1	1	2		
CO4	3	2	3	3	3	2	1	3	1	2	2	-	1	1	2		
CO5	3	2	3	3	3	2	1	3	1	2	3	-	2	2	2		

3 Point Scale – 1, 2, 3

Units	Content	Hrs.
Unit I	Distribution of data- Characteristics of data- Frequency distribution- Procedure for Constructing a Frequency Distribution Using Excel to Construct a Frequency Distribution-Relative Frequency Distribution-Cumulative Frequency Distribution. **Chapter 2 (Page No. 58 - 70)**	6
Unit II	Histograms-Relative Frequency Histogram-Normal Distribution- Common Distribution Shapes-Skewness-Using XLSTAT for Histograms-Graphs-Using Excel to Construct a Scatterplot Correlation Coefficient. **Chapter 2 (Page No. 70 - 81)**	6
Unit III	Time-Series Graph-Dot Plots-Using XLSTAT for Stem Plots-Bar Graphs-Using Excel to Create Bar Graphs-Pareto Charts-Pie Charts-Using Excel to Create Pie Charts-Frequency Polygon -Using Excel to Create Frequency Polygons. **Chapter 2 (Page No. 81 - 98)**	6
Unit IV	Descriptive statistics – Measures of Central tendency – Mean -Using Excel to Calculate the Mean-Median-Using Excel to Find the Median. **Chapter 3 (Page No. 110 - 114)**	6
Unit V	Mode-Using Excel to Find the Mode-Midrange-Using Excel to Calculate the Midrange-Weighted Mean-Using Excel for Descriptive Statistics. **Chapter 3 (Page No. 114 - 125)**	6
	Total Contact Hrs.	**30**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Books:

Mario F. Triola, "Elementary Statistics Using Excel", Fifth Edition, Pearson New International Edition, 2014.

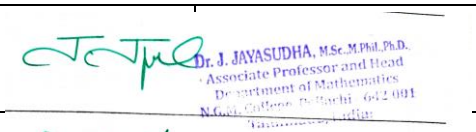
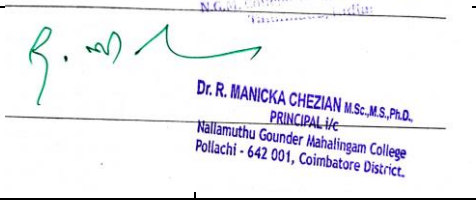
Books for Reference:

1. E. Balagurusamy, "Computer Oriented Statistical and Numerical Methods", Macmillan Publishers India Limited, 2000.
2. V. K. Rohatgi, A. M. E. Saleh, "An introduction to probability and statistics", John Wiley & Sons, 2015.

3. B. Held, B. Moriarty&T. Richardson, “Microsoft Excel Functions andFormulas”, Stylus Publishing, LLC, 2019.
4. N. J. Salkind, “Excel statistics: A quick guide”, SagePublications, 2015.
5. J. Schmuller, “Statistical analysis with Excel for dummies”, John wiley& sons, 2013.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://nptel.ac.in

Course Designed by	Dr. A. GNANASOUNDARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	B.Sc. Mathematics	
Course Code:	26UMS6S2	**Title**	**Batch:**	2026 – 2029
		SEC IV: **Naan Mudhalvan:** Statistical Data Analysis using R-Programming	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	2 (1+1 Lab)		**Credits:**	1

Course Objective

To teach students how to use R for data analysis, including data visualization, descriptive statistics, hypothesis testing, and predictive analytics techniques like regression and time series models.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Recall the basic concepts of R programming, including installation, interface, data types, variables, and data structures.	PO1(3), PO2(1), PO5(1), PO8(1), PO10(1), PO11(1), PO15(1)
CO2	Explain the working of R operations, functions, packages, and data structures such as vectors, data frames, and factors.	PO1(3), PO2(2), PO3(1), PO4(2), PO8(2), PO10(1), PO11(1), PO15(1)
CO3	Apply R programming to create datasets, perform data manipulation, and generate visualizations such as scatter plots and box plots.	PO1(3), PO2(2), PO3(3), PO4(2), PO5(3), PO6(1), PO7(1), PO8(2), PO10(3), PO11(2), PO13(1), PO14(1), PO15(2)
CO4	Analyze data using descriptive statistics and hypothesis testing techniques (t-test, chi-square, ANOVA, correlation) in R.	PO1(3), PO2(3), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(1), PO10(2), PO11(2), PO13(1), PO14(1), PO15(2)
CO5	Evaluate and interpret data using predictive analytics models such as linear regression, multiple regression, logistic regression, and time-series models (ARCH/GARCH).	PO1(3), PO2(3), PO3(3), PO4(3), PO5(3), PO6(3), PO7(1), PO8(3), PO9(1), PO10(2), PO11(3), PO13(2), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	-	-	1	-	-	1	-	1	1	-	-	-	1		
CO2	3	2	1	-	2	-	-	2	-	1	1	-	-	-	1		
CO3	3	2	3	2	3	1	1	2	-	3	2	-	1	1	2		
CO4	3	3	3	3	3	2	1	3	1	2	2	-	1	1	2		
CO5	3	3	3	3	3	3	1	3	1	2	3	-	2	2	3		

3 Point Scale – 1, 2, 3

Units	Contents	Hrs.
Unit-I	Introduction to R programming: What is R? - Installing R and R Studio – R Studio Overview - Working in the Console - Arithmetic Operators - Logical Operations - Using Functions - Getting Help in R and Quitting R Studio Installing and loading packages. Data structures, variables, and data types in R: Creating Variables - Numeric, Character and Logical Data - Vectors - Data Frames - Factors -Sorting Numeric, Character, and Factor Vectors - Special Values.	3
Unit-II	Data Visualization using R: Scatter Plots - Box Plots - Scatter Plots and Box and-Whisker Plots Together -Customize plot axes, labels, add legends, and add colours.	3
Unit-III	Descriptive statistics in R: Measures of central tendency - Measures of variability - Skewness and kurtosis - Summary functions, describe functions, and descriptive statistics by group.	3
Unit-IV	Testing of Hypothesis using R: T-test, Paired Test, correlation, Chi Square test, Analysis of Variance and Correlation	3
Unit-V	Predictive Analytics: linear Regression model, Non-Linear Least Square, multiple regression analysis, Logistic Regression, Panel Regression Analysis, ARCH Model, GARCH models, VIF model	3
	Total Contact Hrs.	15

List of Programs:

1. Creating Vectors, Factors and plotting graphs.
2. Import data, copy data from excel to R
3. Working with variables and data in R
4. Logic statements
5. Bar charts and Pi charts in R
6. Histograms in R
7. Summary statistics in R: Mean, Standard Deviation, Frequencies, t-Test
8. ANOVA
9. Chi-square
10. Correlation and Regression.

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

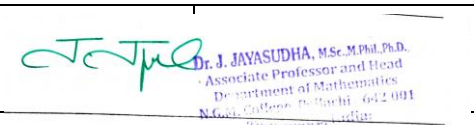
Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

1. Crawley, M. J. (2006), "Statistics - An introduction using R", John Wiley, London 32.
2. Purohit, S.G.; Gore, S.D. and Deshmukh, S.R. (2015), "Statistics using R", second edition. Narosa Publishing House, New Delhi.
3. Shahababa B. (2011) , "Biostatistics with R", Springer, New York.
4. Braun & Murdoch (2007), "A first course in statistical programming with R", Cambridge University Press, New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf
2. https://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/R/R-Manual/R-Manual2.html
3. https://smac-group.github.io/ds/
4. Predictive Analysis in R Programming - GeeksforGeeks

Course Designed by	Dr. A. GNANASOUNDARI	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN	

Programme Code:	UMS	**Programme Title:**	Mathematics	
Course Code:	26UMS6AL	**Title**	**Batch:**	2026 - 2029
		ALC II (OPTIONAL): ADVANCED OPERATIONS RESEARCH - II	**Semester:**	VI
Lecture Hrs./Week or Practical Hrs./Week	-		**Credits:**	3*

Course Objective

The course aims to expose non-linear programming and simulation. Further it helps the student to understand different computational algorithms used in solving non-linear programming problems. The course also enables to schedule projects and build mathematical models to study the real world system.

Course Outcomes (CO)

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

CO Number	CO Statement	
CO1	Understand non-linear programming problems and familiarize different solving procedures	PO1(3), PO2(1), PO3(2), PO4(2), PO5(2), PO6(1), PO8(2), PO10(2), PO11(1)
CO2	Formulate and solve non-linear programming problems using appropriate techniques and interpret the results.	PO1(3), PO2(2), PO3(3), PO4(3), PO5(3), PO6(2), PO7(1), PO8(3), PO9(2), PO10(3), PO11(2), PO13(1), PO14(1), PO15(2)
CO3	Simulate Various real life probabilistic situations using methods like Monte Carlo simulation	PO1(3), PO2(1), PO3(2), PO4(2), PO5(3), PO6(2), PO8(3), PO10(3), PO11(2), PO15(2)
CO4	Analyze the resources efficiently under various constrains and estimate the probability of completing a project on time.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(2), PO8(3), PO9(2), PO10(3), PO11(2), PO13(1), PO14(1), PO15(3)
CO5	Develop critical and analytical skills that enable to apply optimization techniques constructively to any business environment and draw wise decisions.	PO1(3), PO2(1), PO3(3), PO4(3), PO5(3), PO6(2), PO7(2), PO8(3), PO9(2), PO10(2), PO11(2), PO13(2), PO14(2), PO15(3)

Mapping

POs / COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	1	2	2	2	1	–	2	–	2	1	–	–	–	–		
CO2	3	2	3	3	3	2	1	3	2	3	2	–	1	1	2		
CO3	3	1	2	2	3	2	–	3	–	3	2	–	–	–	2		
CO4	3	1	3	3	3	2	2	3	2	3	2	–	1	1	3		
CO5	3	1	3	3	3	2	2	3	2	2	2	–	2	2	3		

3 Point Scale – 1, 2, 3

Units	Content
Unit I	**Non-linear Programming:**Introduction - Formulating a Non-linear Programming Problem (NLPP) - General Non-linear Programming Problem - Constrained Optimization with Equality Constraints - Constrained Optimization with Inequality Constraints. **Chapter 27: Sections: 27.1- 27.5.**
Unit II	**Non-linear Programming - Methods:** Introduction - Quadratic Programming - Wolfe's Modified Simplex Method - Beale's Method. **Chapter 28: Sections: 28.1, 28.4 – 28.6.**
Unit III	**Simulation:** Introduction - Why simulation? - Process of simulation - Simulation models - Even-type simulation - Generation of random numbers - Monte-Carlo Simulation. **Chapter 22: Sections:22.1 - 22.7.**
Unit IV	**Simulation:** Simulation of inventory problems - Simulation of a Queueing System - Simulation of Job Sequencing. **Chapter 22: Sections: 22.8, 22.9 and 22.12.**
Unit V	**Resource Analysis in Network scheduling:** Introduction - Project cost - Time-cost Optimization Algorithm. **Chapter 26: Sections: 26.1 - 26.3.**

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book:

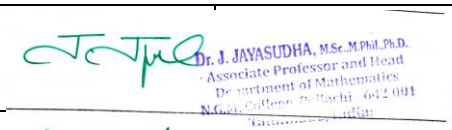
KantiSwarup, Gupta P.K., *Operations Research*, Sultan Chand & Sons, New Delhi - 2014.

Reference Books:

1. Philips T, Ravindran A and Solberg J, *Operations Research: Principles and Practice*, John Willey & Sons, 1976.
2. Taha H. A, *Operation Research - An introduction*, Prentice Hall of India Pvt. Ltd, New Delhi, 2006.
3. P. K Gupta &D. S Hira, *Operations Research*, S. Chand and company Ltd, New Delhi, 2014.
4. S. DharaniVenkatakrishnan, *Operations Research principles problems*, Keerthi Publishing house Pvt. Ltd, 1994.

Related Online Contents[MOOC, SWAYAM,NPTEL, Websites etc.,]

1. https://www.youtube.com/watch?v=xGkpXkAnWU&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=30
2. https://www.youtube.com/watch?v=h0bdo06qNVw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=33
3. https://www.youtube.com/watch?v=H58TPQNr2kM&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX&index=34

Course Designed by	Dr. J. JAYASUDHA	
Verified by HoD	Dr. J. JAYASUDHA	
Approved by Chairman Academic Council	Dr. R. MANICKACHEZIAN