MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

Vaniyambadi – 635 751

PG & Research Department of Mathematics

for

Undergraduate Programme

Bachelor of Science in Mathematics

From the Academic Year 2024-25

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LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE AND POSTGRADUATE EDUCATION

1. **Preamble**

The Department endeavors to be a center of excellence nurturing joyful curiosity in Learning, enthusiastic creativity in research, and passion for building a respectful, free, transparentand dynamic pedagogic community.

To provide an education that transforms students from curriculum to the needs of society. Offer broad and balanced academic programs that are mutually reinforcing and emphasize high quality and creative instruction to the students. We aim to develop well-rounded and thoughtful students prepared to cope with a changing post-modern and globalized world. To provide high quality education, respectful and inclusive environment that builds a foundation for life-long learning.

The Department of Mathematics established in the year 1994 with UG course and it offers PG since 2000. The Department offers research program M.Phil from 2012 and Ph.D from2022.The objective of the Department is to enhance student knowledge towards global perspective and skill oriented. The Department is well known for is teaching and learning process of quality education. The department organizes International Conferences, Seminars, and Hands on training, Workshops, Competitions, Guest lecturers to inculcate the skill of students to face contemporary growth in Mathematics. Memorandum of Understanding with reputed Institutions. Apart from curriculum the department offers Aptitude test, Bridge Course Value Added Courses and NET/SET/CSIR Coaching for the students.

PROGRAMME OUTCOMES (PO)

Programme	B.Sc., Mathematics
Programme Code	US09
Duration	3 years[UG]
Programme Outcomes	**PO1:Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2:Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO3: Problem solving:** Capacity to extrapolate from what one has learned and applies their competencies to solve different kinds of non- familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO4:Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO5: Scientific reasoning:** Ability to analyze interprets and draws conclusions from quantitative/qualitative data; and critically evaluates ideas, evidence and experiences from an open-minded and reasoned perspective. **PO6: Self-directed Lifelong learning:** Ability to work independently, identify and manage a project. Ability to acquire knowledge and skill, including " learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives. **PO7: Lifelong learning:** Ability to acquire knowledge and skills, including learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill Development / re skilling. **PO8: Moral and ethical awareness / reasoning:** Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such

	as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.
Programme Specific Outcomes:	**PSO1:** Acquire good knowledge and understanding, to solve specific theoretical & applied Problems in different area of mathematics & statistics. **PSO1:** Understand, formulate, develop mathematical arguments, logically and use quantitative Models to address issues arising in social sciences, business and other context /fields. **PSO3:** To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, and beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential Organizations.

Eligibility for Admission:

Candidate for admission to the first year of (B.Sc Maths) Department of Mathematics shall be required to have passed the Higher Secondary Examination with Mathematics

Methods of Evaluation and Assessment

Methods of Evaluation		
Internal Evaluation		25 Marks
External Evaluation	End Semester Examination	75 Marks
	Total	**100 Marks**
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand / Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview	
Application (K3)	Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or off beat situations, Discussion, Debating or Presentations	

Semester - I						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA11	Tamil - 1	4	1	0	0	3
24UFUR11	Urdu -1	4	1	0	0	3
24UFEN11	English - 1	4	1	0	0	3
24UMAC11	CC-1 Algebra and Trigonometry	2	1	2	0	4
24UMAC12	CC-2 Differential Calculus	2	1	2	0	4
24UMAA11/ 24UMAA12	EC-1 Numerical Methods I / Physics I	2	1	1	0	3
24UMAS11/ 24UMAS12	SEC – 1 NM-Basic Mathematics / Mathematics for Competitive Exam	1	0	1	0	2
24UMAS13	SEC-2 Mathematics for Competitive Examinations I	1	0	1	0	2
24UMAF11	FC-Bridge Mathematics	1	1	0	0	2
					30	23

Semester - II						
Code	Course Title	Hours Distribution				C
		L	T	P	S	
24UFTA21	Tamil - 2	4	1	0	0	3
24UFUR21	Urdu - 2	4	1	0	0	3
24UFEN21	English - 2	4	1	0	0	3
24UMAC21	CC-3 Integral Calculus	3	1	1	0	4
24UMAC22	CC-4 Analytical Geometry	3	1	1	0	4
24UMAA21/ 24UMAA22	EC-2 Numerical MethodsII / Physics II	3	1	0	0	3
24UMAA21P/ 24UMAA22P	EC - 3 AL Numerical Methods Practicals Using Python/ Physics I & II Practicals	0	0	2	0	2
24UMAS21	SEC-3 Mathematics for Competitive Examinations II	1	0	1	0	2
24UAEC21	AEC – 1 Life Skills Through Yoga	1	1	0	0	2
					30	23

L-Lecture   T-Tutorial   P-Practical   S-Seminar   C-Credit

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, or Naan mudhalvan within the fifth semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAC11	Algebra and Trigonometry	Core Course 1	2	1	2	0	4	5	25	75	100

Learning Objectives	
LO1	Basic ideas on the Theory of Equations
LO2	To gain Knowledge on Summation of Series
LO3	To understand Eigen values and Eigen Vectors
LO4	Knowledge To Find Expansions Of Trigonometry Functions
LO5	Relations Between Hyperbolic And Trigonometric Functions

Unit	Content	Hours
1	Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner's method – related problems.	15
2	Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.	15
3	Characteristic equation –Eigen values and Eigen Vectors -Similar matrices - Cayley –Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3,Diagonalization of square matrices- related problems	15
4	Expansions of $sinn\theta$, $cosn\theta$ in powers of $sin\theta$, $cos\theta$ - Expansion of $tann\theta$ in terms of $\tan\theta$, Expansions of $\cos^n\theta$, $\sin^n\theta$, $cos^m\theta\sin^n\theta$ – Expansion of $\tan(\theta_1 + \theta_2 + \cdots + \theta_n)$-Expansions of $sin\theta$, $cos\theta$ and $tan\theta$ in terms of θ - related problems.	15
5	Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems.	15

CO	Course Outcomes
CO1	To Classify and solve Reciprocal equations
CO2	To Find the sum of Binomial, Exponential, Logarithmic series
CO3	To Find Eigen values, Eigen vectors, verify Cayley – Hamilton theorem

CO4	To Expand the powers and multiples of trigonometric functions in terms of sine and cosine	
CO5	To Determine relationship between circular and hyperbolic functions and the summation oftrigonometric series	

Textbooks:

1	Algebra, Volume 1, T. K. Manicavachagom Pillay, T. Natarajan, K. S. Ganaparthy, S.Viswanathan (Printers & Publishers) Pvt. Ltd., 2013
2	Algebra, Volume 2, T. K. Manicavachagom Pillay, T. Natarajan, K.S.Ganaparthy, S.Viswanathan (Printers & Publishers) Pvt.Ltd., 2008
3	Trignometry, S. Narayanan, T.K. Manicavachagom Pillay, S.Viswanathan (Printers &Publishers) Pvt. Ltd., 2013
4	W.S. Burnstine And A.W. Panton, Theory Of Equations
5	Algebra And Trigonometry, Hari Kishan, R.K. Shrivastav, S.K.Singh, Ram Prasad Publications

Reference Books:

1	David C. Lay, Linear Algebra And Its Applications, 3rd Ed., Pearson Education Asia, IndianReprint, 2007
2	G.B. Thomas And R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005
3	C.V.Durell And A. Robson, Advanced Trigonometry, Courier Corporation, 2003
4	J.Stewart, L. Redlin, And S. Watson, Algebra And Trigonometry, Cengage Learning, 2012.
5	Calculus And Analytical Geometry, G.B. Thomas And R. L. Finny, Pearson Publication, 9thEdition, 2010.

Web resources:

1	https://nptel.ac.in/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	3	2	2	3	2
CO2	3	3	2	3	2	3	2	2	2	3	2
CO3	3	2	2	3	2	3	3	3	2	2	2
CO4	3	3	3	2	3	3	2	2	3	3	3
CO5	3	2	3	2	3	2	3	3	3	2	3
Total	15	13	13	13	12	14	13	12	12	13	12
Average	3	2.6	2.6	2.6	2.4	2.8	2.6	2.4	2.4	2.6	2.4

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAC12	Differential Calculus	Core Course 2	2	1	2	0	4	5	25	75	100

	Learning Objectives
LO1	The basic skills of successive differentiation and their applications.
LO2	To know about Partial Differentiation
LO3	To gain Knowledge on Maxima and Minima of functions of two variables
LO4	To originate Method of finding the Envelope
LO5	Basic concepts on curvature and evolutes

Unit	Content	Hours
1	**Successive Differentiation:** Introduction (Review of basic concepts) – The nth derivative – Standard results– Fractional expressions - Trigonometrical Transformation – Formation of equations involving derivatives – Leibnitz formula for the derivative of a product – Feynman's method of differentiation	15
2	**Partial Differentiation:** Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions.	15
3	**Partial Differentiation (Continued):** Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.	15
4	**Envelope:** Method of finding the envelope – Another definition of envelope– Envelope of family of curves which are quadratic in the parameter.	15
5	**Curvature:** Definition of Curvature – Circle, Radius and Centre of Curvature –Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates.	15

CO	Course Outcomes
CO1	To find the nth derivative, form equations involving derivatives and apply Leibnitz formula
CO2	To find the partial derivative and total derivative coefficient
CO3	To Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers

CO4	To Find the envelope of a given family of curves	
CO5	To Find the evolutes and involutes and radius of curvature using polar coordinates	

Textbooks:	
1	Calculus Volume –I, S. Narayan M.A , Retaired Professor Department of Mathematics (U.G.C), Vivekananda College , Madras, T.K. Manicavachagom Pillay , M.A., L.T., Retired Professor, Department of Mathematics, A.G. College of Techonology Guindy, Madras, S. Viswanathan (Printers & Publishers) Chennai.
2	H. Anton, i. Birens and s. Davis, calculus, john wiley and sons, inc., 2002.
3	Differential Calculus , Published by Discovery Publishing House, New Delhi
4	M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P.Ltd. (Pearson Education), Delhi, 2007.
5	Shanti Narayan, Formerly , Dean of College – Delhi University , Delhi and Principal , Hans Raj College, Delhi, Revised by ,D.R. P.K. Mittal M.Scf.,Ph.D ,Head of the Mathematics Department. Govt. Post Graduate College Rishikesh (Uttaranchal) , S Chand and Company Limited

Reference Books:	
1	R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer-Verlag, New York, Inc., 1989.
2	T. Apostol, Calculus, Volumes I and II.
3	S. Goldberg, Calculus and mathematical analysis.
4	G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010.
5	Differential Calculus by N P Bali, Lakshmi Publishers

Web resources:	
1	https://nptel.ac.in/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	2	2	2	3
CO2	3	3	2	3	3	3	2	2	2	2	3
CO3	3	2	2	3	2	3	3	3	2	2	2
CO4	3	3	3	2	2	3	2	2	2	3	3
CO5	3	2	3	2	3	2	3	3	3	3	2
Total	15	13	13	13	13	14	13	12	11	12	13
Average	3	2.6	2.6	2.6	2.6	2.8	2.6	2.4	2.2	2.4	2.6

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAA11	Numerical Methods-I	Elective Core	2	1	1	0	3	4	25	75	100

	Learning Objectives										
LO1	To know the methods of solving Algebraic and Transcendental Equations										
LO2	To acquire knowledge on solving simultaneous linear equations.										
LO3	Knowledge about central difference operators										
LO4	To acquire knowledge about Interpolation										
LO5	To study Newton's divided difference formula and problems based on Lagrange's interpolation formula.										

Unit	Content	Hours
1	Solutions of Algebraic and Transcendental Equations: Bisection Method-Iteration Method- Regula-Falsi Method-Newton-Raphson Method. Chapter 1 : Section 1.1 to1.4	12
2	Solutions of Simultaneous Linear Equations: Gauss-Elimination Method, Gauss-Jordan Method, Gauss Jacobi Method, Gauss Seidel Method. Chapter 2 :Section 2.1 to 2.3	12
3	Finite Differences: E Operators and Relation between them - Differencesof Polynomial-Factorial Polynomials. Chapter 3 :Section 3.1 to 3.4	12
4	Interpolation with Equal Intervals: Newton's Forward and Backward Interpolation formulae. Central Differences Formulae: Gauss-Forward and Backward Formulae - Stirling's Formula and Bessel's Formula. Chapter 4 :Section 4.1to 4.3 (omit 4.1a) Chapter 5 :Section 5.1to 5.6	12
5	Interpolation with Unequal Intervals: Divided Differences - Newton's Divided Differences Formula for Interpolation -Lagrange's Formula for Interpolation-Inverse Interpolation-Lagrange's method. Chapter 6 :Section 6.1, 6.2, 6.5 & 6.7	12

CO	Course Outcomes
CO1	After studied unit -1, the student will be able to solve Iteration method- Regula-falsi method-Newton-Raphson method.
CO2	After studied unit -2, the student will be able to calculate interpolation values by applying Gauss-Elimination method, Gauss-Jordan method.
CO3	After studied unit -3, the student will be able to calculate Differences of a polynomial, Factorial polynomials.
CO4	After studied unit -4, the student will be able to estimate Central Differences Formulae.

CO5	After studied unit -5, the student will be able to estimate the interpolation value for unequal intervals based on Divided Difference formula and Lagrange's formula of interpolation.	

Textbooks:

1	P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis,S. Chand & Company Ltd., New Delhi-55.
2	Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chand and Company Ltd, New Delhi – Revised Edition 2007.
3	Numerical Methods, G.Balaji, HOD, Department of Maths , Thangevelu Engineering College Chennai ,June 2009, G.Balaji Publisher,Chennai-33
4	Finite Difference and Numerical Analysis, H.C. Saxena, Former Senior Lectures, Department of Maths, Ramjas College, Delhi University, Delhi,2000, S.chand &Company Ltd., New delhi -110055
5	Numerical Methods in Science and Engineering , Dr. M.K. Venkataraman, M.A., M.Tech.,Ph.D, Retires Proffessor of Mathematics, Alagappa Chettigar College of Engineering and Techonology, Karaikudi, 2007 ,The National Publishing Company , Chennai

Reference Books:

1	H.C. Saxena. (1991) Finite differences and Numerical analysis S.Chand& Co., Delhi
2	M.K. Venkataraman. (1992) Numerical methods for Science and Engineering National Publishing Company, Chennai.
3	Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition Prentice Hall India 2004.
4	Numerical Analysis, Dr. B.SW. Goel, Senior Deputy director, Institute of productivity and Management Ghaziabed, Dr.S.K. Mittal , Department of Maths, M. M. College , Modinagar (Meerut University)1993, Chand offset Printer, Chennai
5	Venkataraman M. K.,"Numerical Methods in Science and Engineering" National Publishing company V Edition 1999

Web resources:

1	https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall-2014/pages/syllabus/
2	https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2004/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	2	2	3	2
CO2	3	3	2	3	3	3	2	2	2	3	2
CO3	3	2	2	3	2	3	3	3	2	2	2
CO4	3	3	3	2	2	3	2	2	3	3	2
CO5	3	2	3	2	3	2	3	3	3	2	3
Total	15	13	13	13	13	14	13	12	12	13	11
Average	3	2.6	2.6	2.6	2.6	2.8	2.6	2.4	2.4	2.6	2.2

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAS13	Mathematics for Competitive Examinations	Skill Enhancement Course 2	1	0	1	0	2	2	25	75	100

	Learning Objectives
LO1	To study on number system.
LO2	To answer real life simple problems by using HCF and LCM.
LO3	To know about the correct sequence on mathematical expressions.
LO4	To acquire knowledge in solving the problems involving square roots, cube roots and average
LO5	To carry out the problems related to age and Indices

Unit	Content	Hours
1	Number System.	6
2	H.C.F and L.C.M of numbers.	6
3	Decimal Fractions, Simplification.	6
4	Averages, Percentage.	6
5	Problems on numbers, Problems on Age.	6

CO	Course Outcomes
CO1	To Solve Mathematical Problems using Mathematical formulae.
CO2	To Understand the knowledge of application of Mathematics
CO3	To Understand the concepts of simplification.
CO4	To Calculate the square root and cube root.
CO5	To Solve the problems on age

Textbooks:

1. R.S. Aggarwal [2017], Quantitative Aptitude for Competitive Examinations, S. Chand and Company, New Delhi. Chapters11-13, 18, 19, 22, 23.
2. Quantitative Aptitude Quantum CAT Common Admission Tests for Admission into IIMs by Sarvesh K. Verma - Arihant
3. The Pearson Guide to Quantitative Aptitude for Competitive Examinations by Dinesh Khattar - Pearson
4. How to Prepare for Quantitative Aptitude for CAT by Arun Sharma - Tata McGraw Hill
5. Quantitative Aptitude for the CAT by Nishit K Sinha - Pearson

Reference Books:

1. Praveen R.V, Quantitative Aptitude and reasoning, PHIL earning Pvt, New Delhi

2	Abhijit Guha-Quantitative Aptitude for Competitive Examinations-6th Edition-Mc Graw Hill Education Pvt Ltd, Chennai	
3	U. Mohan Rao-Quantitative Aptitude for Competitive Examinations-Scitech Publications Pvt Ltd, Chennai.	
4	Arun Sharma-Teach Yourself Quantitative Aptitude- Mc Graw Hill Education Pvt Ltd, Chennai-second Edition	
5	Rapid Quantitative Aptitude-Er.Deepak Agarwal, Mr. D. P. Gupta –Disha Nursuring Ambitions	

Web resources:

1	https://guides.lib.uni.edu/oer

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	2	3	3	2	2	2
CO2	2	3	3	2	2	3	2	2	2	3	3
CO3	3	3	2	3	3	2	3	3	2	3	2
CO4	3	2	3	3	3	3	3	3	3	2	3
CO5	3	3	3	2	3	3	2	1	2	3	3
Total	14	13	13	13	14	13	13	12	11	13	13
Average	2.8	2.6	2.6	2.6	2.8	2.6	2.6	2.4	2.2	2.6	2.6

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAF11	Bridge Mathematics	Foundation Course	1	1	0	0	2	2	25	75	100

	Learning Objectives
LO1	Basic concepts on Algebra
LO2	To know about Sequence and Series
LO3	To study on Permutations and combinations
LO4	To acquire knowledge on trigonometric ratios
LO5	To gain knowledge on Calculus

Unit	Content	Hours
1	Algebra: Binomial theorem, General term, middle term, problems based on these concepts.	6
2	Sequences and series principle of counting, Factorial n.	6
3	Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups	6
4	Trigonometry: Introduction to trigonometric ratios, proof of $sin(A+B)$, $cos(A+B)$, $tan(A+B)$ formulae, multiple and sub multiple angles, $sin(2A)$, $cos(2A)$, $tan(2A)$ etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule	6
5	Calculus: Limits, standard formulae and problems, differentiation, first Principle, uv rule , u/v rule, methods of differentiation, application of derivatives, integration- product rule and substitution method.	6

CO	Course Outcomes
CO1	To Prove the binomial theorem and apply it to find the expansions of any $(XX+Y)^n$ andalso, solve the related problems
CO2	To Find the various sequences and series and solve the problems related to them. Explain theprinciple of counting.
CO3	To Find the number of permutations and combinations indifferent cases. Apply the principleof counting to solve the problems on permutations and combinations
CO4	To Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and sub multiple angles, etc. Also, they can solve the problems using the transformations.

CO5	To Find the limit and derivative of a function at a point, the definite and indefinite integral ofa function. Find the points of min/max of a function.	

Textbooks:	
1	NCERT class XI textbooks.
2	NCERT class XII textbooks.
3	Any State Board Mathematics textbooks of class XI
4	Any State Board Mathematics textbooks of class XII
5	Bridge course in Mathematics, Part-1, Edited by R. S. Sharma (IIT Delhi)

Reference Books:	
1	Algebra, Volume I, T. K. Manicavachagom Pillay, T. Natarajan, K S Ganapathy, S. Viswanathan printers and Publishers, PVT, LTD, 2008
2	Trigonometry, S. Narayanan, T. K. Manicavachagom Pillay, S. Viswanathan printers andPublishers, PVT, LTD, 2008
3	S. Goldberg, Calculus and mathematical analysis.
4	Algebra, Volume II, T. K. Manicavachagom Pillay, T. Natarajan, K S Ganapathy, S. Viswanathan printers and Publishers, PVT, LTD, 2008
5	T. Apostol, Calculus, Volumes I and II.

Web resources:	
1	https://nptel.ac.in/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	3	3	2	2	2
CO2	2	3	3	2	2	3	2	2	2	3	2
CO3	3	3	2	2	3	2	3	3	2	3	2
CO4	3	2	3	2	3	3	3	3	3	2	2
CO5	3	3	3	3	3	3	2	1	2	3	3
Total	14	13	13	11	14	13	13	12	11	13	11
Average	2.8	2.6	2.6	2.2	2.8	2.6	2.6	2.4	2.2	2.6	2.2

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAC21	Integral Calculus	Core Corse 3	3	1	1	0	4	5	25	75	100

	Learning Objectives
LO1	To develop knowledge on integration and trigonometric functions
LO2	To evaluate double integrals in Cartesian and polar coordinates
LO3	To Understand the concept of triple integrals
LO4	To learn about Beta and Gamma functions
LO5	To acquire knowledge on the Applications of Integral Calculus

Unit	Content	Hours
1	**Reduction formulae** Bernoulli's formula – Reduction Formulae – Solved Problems **Chapter 11: Page No : 11.1-11.32**	15
2	**Multiple Integrals** Definition of double integrals - Evaluation of double integrals – double integrals in polar coordinates – Change of order of Integration. **Chapter 17: Page No.: 17.1 – 17.17,17.22 – 17.32**	15
3	**Multiple Integrals (Continuation)** Definition of Triple integral - Evaluation of Triple integral - Applications of double and Triple integral. **Chapter 17: Page No: 17.18 – 17.22 to 17.33 – 17.43**	15
4	**Beta and Gamma functions** Definitions - Properties of Beta and Gamma functions - Relation between Beta and Gamma functions – Finite and Infinite integral of Beta and Gamma functions **Chapter 13: Page No: 13.1 – 13.30**	15
5	**Geometrical Applications of Integral calculus** Area under plane curves - Volume of solid of revolution - Length of an arc of a curve - Area of surface of revolution – Applications – Simple Problem **Chapter 21 - 24**	15

CO	Course Outcomes
CO1	Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae
CO2	Learn double integrals and problems using change of order of integration
CO3	Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution
CO4	Know beta and gamma functions and to use them in solving problems of integration.
CO5	Understand Geometric and Physical applications of integral calculus
Textbooks:	
1	Dr.P .R. Vittal, V.Malini, Calculus, Margam Publications 2012, Chennai (Unit 1 - 4)
2	Dr.P .R. Vittal, Mathematical Foundations, Margam Publications 2011, Chennai (Unit 5)
Reference Books:	
1	H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002
2	G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007
3	D. Chatterjee, Integral Calculus and Differential Equations, Tata- McGraw Hill Publishing Company Ltd.
4	Dr.P.R. Vittal, Mathematical Foundations, Margam Publications, Chennai
5	A.K.Sharma, Text Book of Integral Calculus, Discovery Publishing House, 2005
Web resources:	
1	https://nptel.ac.in

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	2	3	2	3	2
CO2	2	3	3	3	3	2	2	3	2	3	3
CO3	3	3	2	3	3	3	2	3	2	3	2
CO4	2	3	2	3	3	2	2	3	2	3	2
CO5	3	2	3	3	3	3	2	3	2	2	3
Total	13	14	12	15	15	13	10	15	10	14	12
Average	2.6	2.8	2.4	3	3	2.6	2	3	2	2.8	2.4

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAC22	Analytical Geometry	Core Corse 4	3	1	3 1	0	4	5	1 25	75	100 1

	Learning Objectives
LO1	To understand and apply the concept of homogeneous equations of second degree to represent straight lines in different forms
LO2	To derive polar equations for straight lines, circles, and conic sections and analyze their geometric properties
LO3	To formulate general equations of planes, calculate angles between two planes, and determine plane equation through intersection of two planes
LO4	To calculate the angle between a line and a plane and analyze coplanar and skew lines
LO5	To originate equation of sphere, determine length of tangent and analyze plane section of sphere

Unit	Content	Hours
1	**Pair of Straight lines:** Introduction – Homogeneous equation of second degree - Condition for a second - degree equation to represent a pair of straight lines – Angle between the lines. **Chapter III Pages: 68-88**	15
2	**Polar Equations:** Introduction – Definition of polar coordinates – Transformation of polar coordinates and Cartesian coordinates – Equation of a straight line – Circle and its applications – Polar equation of a conic **Chapter IX Pages: 325-340**	15
3	**Plane:** Introduction – General equation of plane – Angle between two planes – Plane passing through: Three given points, Intersection of two given planes - Length of perpendicular **Chapter II Pages :24-40**	15
4	**Straight Line:** Introduction – Equations of straight Lines – The plane and the straight line - Angle between a line and plane – Applications on Coplanar lines and Skew lines **Chapter III Pages :46-75**	15
5	**Sphere**: Equation of sphere – Length of the tangent – Section of a sphere – Equation of circle – Intersection of two spheres - Tangent plane. **Chapter IV Pages :92-114**	15

CO	Course Outcomes
CO1	Understand and apply the concept of homogeneous equations of second degree to represent straight lines in different forms.
CO2	Derive polar equations for straight lines, circles, and conic sections, and analyze their geometric properties
CO3	Formulate general equations of planes, calculate angles between two planes, and determine the plane equation through intersection of planes.
CO4	Calculate the angle between a line and a plane and analyze coplanar and skew lines.
CO5	Formulate equations of sphere, determine length of tangent, and analyze plane section of sphere.
Textbooks:	
1	T.K. Manicavachagom Pillay & T. Natarajan, Analytical Geometry of Two dimensions, S. Viswanathan (Printers & Publishers) Pvt Ltd, Chennai(2007) (Unit 1 & 2)
2	T.K. Manicavachagom Pillay & T. Natarajan, Analytical Geometry of Three dimensions, S.Viswanathan(Printers & Publishers) Pvt Ltd, Chennai (2007) (Unit 3,4 & 5)
Reference Books:	
1	P.R.Vittal(2023), Analytical Geometry 2D and 3D, Pearson Publications, Chennai.
2	Shanti Narayan, Analytical Solid Geometry, S. Chand Publications, New Delhi.
3	P.Duraipandian and Laxmi Duraipandian, Analytical Geometry Two dimensions, Emerald Publication.
4	P. Duraipandian and Kayalal Pachaiyappa(2009), Analytical Geometry 3D, Muhil Publishers, Revised Edition.
5	P.R.Vittal (2003) Coordinate Geometry. Margham Publishers, Chennai.
Web resources:	
1	https://mathworld.wolfram.com/
2	http://www.univie.ac.at/future.media/moe/galarie.html/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO2	3	3	3	3	2	3	3	3	3	2	3
CO3	3	3	3	3	2	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3	3	3	2	3
CO5	3	3	3	3	3	3	3	2	3	2	3
Total	15	15	15	15	12	15	15	14	15	10	15
Average	3	3	3	3	2.4	3	3	2.8	3	2	3
CO2	3	3	3	3	2	3	3	3	3	2	3

3 – Strong, 2- Medium, 1- Lo

1st YEAR: SECOND SEMESTER

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	CIA	External	Total
									Marks		
24UMAA21	Numerical Methods II	Elective Course 2	3	1	0	0	3	4	25	75	100

	Learning Objectives
LO1	To evaluate derivatives using Newton's Forward and Backward Difference Formulae
LO2	To acquire the knowledge about evaluation of numerical integration
LO3	To evaluate the solution of linear homogeneous and non- homogeneous difference equations with constant coefficients
LO4	To obtain numerical solutions to the ordinary differential equations by Taylor's series method-Picard's method
LO5	To acquire the knowledge on Euler's and Modified Euler's Method -Runge-Kutta Method

Unit	Content	Hours
1	**Numerical Differentiation:** Derivatives using Newton's Forward and Backward Difference Formulae- Derivatives using Stirling's Formula- Derivatives using Divided Difference Formula- Maxima and Minima using the above Formulae **Chapter 7: Section 7.1 to 7.4 , 7.6**	12
2	**Numerical Integration:** Introduction - General Quadrature formula -Trapezoidal Rule-Simpson's One-Third Rule - Simpson's Three-EighthRule-Application **Chapter 7: Section 7.7- 7.9 , 7.13- 7.14**	12
3	**Difference Equations:** Linear Homogenous and Non-Homogenous Difference Equation with constant coefficients- Simple problem **Chapter 8: Section 8.1 - 8.4 , 8.6**	12
4	**Numerical solution of Ordinary Differential Equations (I order only):** Taylor's series method and its application- Picard's method **Chapter 9: Section 9.5 - 9.6**	12
5	**Numerical Solution of Ordinary Differential Equations (I order only):** Euler's Method - Modified Euler's Method - Runge - Kutta Method (Fourth Order only). **Chapter 9: Section 9.7,9.9 - 9.11**	12

CO	Course Outcomes
CO1	Compute derivatives using numerical differentiation methods
CO2	Understand numerical integration using various methods
CO3	Evaluate linear homogeneous and non- homogeneous difference equations with constant coefficients
CO4	Derive numerical solutions to the ordinary differential equations by Taylor's series method-Picard's method
CO5	Estimate approximate numerical solutions of ordinary differential equations by Euler, Modified Euler's and Runge - Kutta methods

Textbooks:

1	P.Kandasamy and K.Thilagavathy, Calculus of Finite differences & Numerical Analysis, S.Chand & Company Ltd., New Delhi, 2003.

Reference Books:

1	Venkataraman M. K, Numerical Methods in Science and Engineering, NationalPublishing Company V Edition 199
2	S.S.Sastry, IntroductoryMethods of Numerical Analysis, Prentice, Hall of India, New Delhi
3	H.C.Saxena, Finite Difference and Numerical Analysis, Delhi, 2000, S.Chand & amp, Company ltd, New delhi-110055
4	Sankara Rao K, Numerical Methods for Scientists and Engineers, 2nd Edition PrenticeHall India 2004.
5	B.D.Gupta ,Numerical Analysis, Konark Pub.Ltd, Delhi, 2001.

Web resources:

1	https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall-2014/pages/syllabus/
2	https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2004/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	3	3	3	3	2
CO2	3	3	2	2	3	3	3	3	2	2	3
CO3	3	2	2	3	2	2	3	3	2	3	2
CO4	2	3	2	3	2	2	3	3	2	3	2
CO5	3	2	2	2	3	2	3	2	2	2	3
Total	14	13	11	13	12	11	15	14	11	13	12
Average	2.8	2.6	2.2	2.6	2.4	2.2	3	2.8	2.2	2.6	2.4

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAA21	Applied Numerical Methods I & II Practical Using Python	Elective Course 3	1	0	1	0	2	2	25	75	100

Learning Objectives

	Learning Objectives
LO1	To understand the concepts of derivatives using Newton's methods
LO2	To acquire the knowledge on Gauss -Elimination, Jacobi and Seidel method.
LO3	To obtain the solution of finite differences using Newton's forward and backward differences formulae
LO4	To understand the method of Lagrange interpolation, Trapezoidal and one-Third rules.
LO5	To acquire the knowledge on Picard's Method, Euler's and Runge- Kutta Method.

	List of Problems	Hours
	1.Bisection methods. 2. Gauss Elimination method. 3. Gauss-Jacobi method. 4. Gauss-Seidal method. 5. Newton's forward and backward interpolation 6. Lagrange interpolation. 7. Trapezoidal rule. 8. Simpson one-third rules. 9. Euler's method. 10. Runge-Kutta's method.	12

CO	Course Outcomes
CO1	Interpret Newton's method using python
CO2	Understanding the concepts of Gauss -Elimination, Jacobi and Seidal method using python
CO3	Learn to find the solution of finite differences using Newton's forward and backward interpolation formulae
CO4	Understanding the methods of Lagrange interpolation, Trapezoidal and One-Third rules
CO5	Estimate approximate numerical solutions of ordinary differential equations by Picard's, Euler and Runge-Kutta methods.
Textbooks:	
1	Python programming & Numerical Methods: A Guide for Engineers & Scientists – Qingkai Kong, Timmy Siauw, Alexandre Bayen
Reference Books:	
1	Robert Johanson, Numerical Python: A Practical Techniques Approach for Industry, Apress online

Web resources:	
1	https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall-2014/pages/syllabus//
2	https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2004//

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	3	3	2	3
CO2	3	3	2	2	3	3	2	3	2	3	3
CO3	3	2	2	3	2	2	2	3	2	2	2
CO4	2	3	3	3	2	3	2	3	3	2	3
CO5	3	2	2	2	3	2	2	3	2	3	2
Total	14	13	14	13	12	13	10	15	14	12	13
Average	2.8	2.6	2.8	2.6	2.4	2.6	2	3	2.8	2.4	2.6

3 – Strong, 2- Medium, 1- Low

Course Code	Course Name	Category	L	T	P	S	Credits	Hours	Marks		
									CIA	External	Total
24UMAS2**1**	Mathematics For Competitive Examinations-II	Skill Enhancement Course 3	1	0	1	0	2	2	25	75	100

	Learning Objectives
LO1	To solve problems on time, work and distance using appropriate formulae
LO2	To calculate simple and compound interest and to draw graphs
LO3	To identify and calculate logical sequences
LO4	To evaluate data sufficiency and understanding the concepts of decisions making
LO5	To analyze and solve problems related to non-verbal reasoning

Unit	Content	Hours
1	Time and work – Time and distance – Problems on Trains. **Chapters :15,17,18**	6
2	Simple Interest, Compound Interest– Bar Graph – Pie Charts– Line Graphs. **Chapters :21,22,37,38,39**	6
3	**Verbal Reasoning:** Logical Sequence of Words–Arithmetical Reasoning – Inserting the Missing Character. **Chapters: 14,15,16**	6
4	**Verbal Reasoning (Contd..)**: Data Sufficiency – Assertion & Reason – Verification of Truth of the Statement. **Chapters :17,19,21**	6
5	**Non-Verbal Reasoning:** Mirror Images – Water Images– Grouping of identical Figures. **Chapters :5,6,13**	6

CO	Course Outcomes
CO1	Solve problems involving time, work, and distance using appropriate formulas
CO2	Calculate both simple and compound interest
CO3	Identify and calculate logical sequences, recognizing patterns
CO4	Evaluate data sufficiency and decisions making skills
CO5	Analyze and solve problems related to non-verbal reasoning
Textbooks:	
1	Dr. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Ltd. 2010 (Unit 1 & 2)
	Dr. R.S. Aggarwal, A Modern Approach to Verbal and Nonverbal Reasoning, S. Chand, 2022 (Unit 3, 4 & 5)
Reference Books:	
1	R.V. Praveen, Quantitative Aptitude and Reasoning, Third Edition, PHIL earning Pvt, New Delhi
2	U. Mohan Rao, Quantitative Aptitude for competitive examinations, SciTech Publications Pvt Ltd, Chennai
Web resources:	
1	https://guides.lib.uni.edu/over

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO2	2	3	3	2	2	3	2	2	2	3	3
CO3	3	3	2	3	3	2	3	3	2	3	2
CO4	3	2	3	3	3	3	3	3	3	2	3
CO5	3	3	3	2	2	3	2	1	2	3	3
Total	14	13	13	13	14	13	13	12	11	13	13
Average	2.8	2.6	2.6	2.6	2.8	2.6	2.6	2.4	2.2	2.6	2.6
CO2	2	3	3	2	2	3	2	2	2	3	3

3 – Strong, 2- Medium, 1- Low