

DHANALAKSHMI SRINIVASAN INSTITUTE OF RESEARCH AND TECHNOLOGY

**(Deemed to be University under section 3 of UGC Act, 1956.)
PERAMBALUR – 621 212, TAMIL NADU, INDIA.**

SCHOOL OF ARTS AND SCIENCE

CURRICULUM AND SYLLABUS

B.Sc. MATHEMATICS

REGULATION 2026

PROGRAMME:

Vision:

- To serve as a vibrant hub for mathematical excellence at the undergraduate level, inspiring curious young learners, logical thinkers, and analytical minds who master mathematical principles to solve real-world problems and contribute to scientific and technological progress

Mission:

- To cultivate interdisciplinary collaboration, professional ethics, and leadership qualities among students and faculty for holistic development.
- To offer inclusive, flexible, and interdisciplinary undergraduate programs in mathematics that integrate pure and applied concepts with allied disciplines, building graduates with strong logical reasoning, quantitative, and problem-solving skills for diverse career paths and lifelong learning.
- To encourage foundational research and scholarly inquiry in mathematical theories, modeling, statistics, and computational methods, addressing key challenges in science, industry, education, and daily applications.
- To expand access to quality mathematics education for rural and underprivileged students by connecting modern mathematical tools with traditional knowledge systems and developing practical competencies that support entrepreneurial opportunities and self-reliant careers.
- To instill ethical values, social responsibility, and global awareness through hands-on problem solving, industry interactions, community projects, and experiential learning that links theoretical knowledge with real-world mathematical applications

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO	PROGRAM EDUCATIONAL OBJECTIVES
PEO1	To provide graduates with a solid foundation in core mathematical concepts, theories, and techniques, preparing them for successful careers in teaching, data analysis, banking, and higher studies.

PEO2	To develop logical thinking, analytical abilities, and problem-solving skills so that graduates can apply mathematical principles to investigate and resolve issues in science, engineering, and other domains.
PEO3	To foster professional ethics, effective communication, and teamwork that enable graduates to collaborate effectively and contribute responsibly to multidisciplinary environments.
PEO4	To promote lifelong learning and adaptability, empowering graduates to keep pace with evolving mathematical applications and pursue advanced education or professional growth.

PROGRAM SPECIFIC OUTCOMES(PSOs)

PSO	PROGRAM SPECIFIC OUTCOMES
PSO1	Graduates will be proficient in applying fundamental concepts of algebra, calculus, differential equations, and discrete mathematics to model and solve theoretical and practical problems.
PSO2	Graduates will demonstrate competence in statistical analysis, numerical methods, mathematical software tools, and logical reasoning, enabling them to contribute effectively in data-driven roles, research support, teaching, and community analytical initiatives.

PROGRAM OUTCOMES (Pos)

PO	PROGRAM OUTCOMES
PO1	Disciplinary Knowledge Demonstrate comprehensive knowledge and understanding of the fundamental concepts, theories, principles, and applications in the chosen discipline and allied fields.
PO2	Critical Thinking and Problem Solving Identify, analyze, and solve complex academic, professional, and societal problems using logical reasoning, analytical skills, and evidence-based approaches.
PO3	Research and Inquiry Apply scientific methods, research techniques, and investigative skills to conduct studies, analyze data, interpret results, and draw meaningful conclusions.

PO4	Creativity and Innovation Develop innovative ideas, creative solutions, and entrepreneurial approaches to address contemporary challenges in academic, professional, and social contexts.
PO5	Digital and Technological Competence Utilize appropriate digital technologies, software tools, and information resources effectively and ethically for learning, research, communication, and problem-solving.
PO6	Environment and Sustainability Understand environmental issues and sustainable development goals and apply this knowledge to promote ecological balance and responsible resource utilization.
PO7	Ethics and Social Responsibility Demonstrate ethical values, integrity, inclusiveness, and social responsibility while contributing positively to society and professional environments.
PO8	Teamwork and Leadership Work effectively as an individual and as a member or leader of diverse and multidisciplinary teams, demonstrating leadership, collaboration, and interpersonal skills.
PO9	Communication Skills Communicate effectively through oral, written, visual, and digital means with diverse audiences in academic, professional, and societal settings.
PO10	Employability and Entrepreneurship Develop professional competencies, managerial abilities, and entrepreneurial skills required for employment, higher education, and self-employment opportunities.
PO11	Lifelong Learning Recognize the need for continuous learning, adaptability, and self-development to meet evolving personal, professional, and societal demands in a dynamic global environment.

SEMESTER-I

Semester	Part	Course Category	Title of the Course	Course Code	L	T	P	Credits	Marks		
									CAT	ESE	Total
I	I	AEC	Tamil/Hindi/French-I	TA26C01/HA26C01/FA26C01	3	0	0	3	40	60	100
	II	AEC	English-I	EN26C01	3	0	0	3	40	60	100
	III	Core	Analytical Geometry(3D)	UMA26101	3	0	0	3	40	60	100
		Core	Analytical Geometry using GeoGebra (P)	UMA26102	0	0	4	2	40	60	100
		Core	Classical Algebra	UMA26103	3	1	0	4	40	60	100
		MDC	Multi-Disciplinary Course-I	-	3	0	0	3	40	60	100
	IV	VAC	Human values	UVA26001	2	0	0	2	40	60	100
								20			700

SEMESTER-II

Semester	Part	Course Category	Title of the Course	Course Code	L	T	P	Credits	Marks		
									CAT	ESE	Total
II	I	AEC	Tamil/Hindi/French-II	TA26C02/HA26C02/FA26C02	3	0	0	3	40	60	100
	II	AEC	English-II	EN26C02	3	0	0	3	40	60	100
	III	Core	Calculus	UMA26204	3	0	0	3	40	60	100
		Core	Calculus using SCILAB	UMA26205	0	0	4	2	40	60	100
		Core	Theory of Equations & Trigonometry	UMA26206	3	1	0	4	40	60	100
		MDC	Multi-Disciplinary Course-II	-	3	0	0	3	40	60	100
	IV	VAC	Environmental Studies and Sustainability	UVA26002	2	0	0	2	40	60	100
								20			700

SEMESTER-III

Semester	Part	Course Category	Title of the Course	Course Code	L	T	P	Credits	Marks		
									CAT	ESE	Total
III	I	AEC	Tamil/Hindi/French-III	TA26C03/HA26C03/FA26C03	3	0	0	3	40	60	100
	II	AEC	English-II	EN26C03	3	0	0	3	40	60	100
	III	Core	Differential Equation	UMA26307	3	0	0	3	40	60	100
		Core	Differential Equation with MATLAB	UMA26308	0	0	4	2	40	60	100
		MDC	Multi-Disciplinary Course-III	-	3	0	0	3	40	60	100
		DEC	Disciplinary Elective Course -I	UMA26001	4	0	0	4	40	60	100
			Disciplinary Elective Course -II	UMA26002							
			Disciplinary Elective Course -III	UMA26003							
	IV	VAC	IKS	UVA26003	3	0	0	3	40	60	100
								21			700

SEMESTER-IV

Semester	Part	Course Category	Title of the Course	Course Code	L	T	P	Credits	Marks		
									CAT	ESE	Total
IV	I	AEC	Tamil/Hindi/French-IV	TA26C04/HA26C04/FA26C04	3	0	0	3	40	60	100
	II	AEC	English-II	EN26C04	3	0	0	3	40	60	100
	III	Core	Numerical Methods	UMA26409	3	0	0	3	40	60	100
		Core	Numerical Methods with MATLAB	UMA26410	0	0	4	2	40	60	100
		MDC	Multi-Disciplinary Course-IV	-	3	0	0	3	40	60	100
		DEC	Disciplinary Elective Course -IV	UMA26004	3	0	0	3	40	60	100
			Disciplinary Elective Course -V	UMA26005							
			Disciplinary Elective Course -VI	UMA26006							
	IV	VAC	Ethics in AI	UVA26004	3	0	0	3	40	60	100
	V	EAA	Extra Academic Activity (NSS, NCC, YRC....)					1*			
								20			700

SEMESTER-V

Semester	Part	Course Category	Title of the Course	Course Code	L	T	P	Credits	Marks		
									CAT	ESE	Total
V	III	Core	Abstract Algebra	UMA26511	4	0	0	4	40	60	100
		Core	Real Analysis	UMA26512	4	0	0	4	40	60	100
		Core	Vector Calculus & Fourier Series	UMA26513	4	0	0	4	40	60	100
		DEC	Disciplinary Elective Course -VII	UMA26007	2	1	0	3	40	60	100
			Disciplinary Elective Course -VIII	UMA26008							
			Disciplinary Elective Course -IX	UMA26009							
		SEC	SPSS Programming	UMA26S01	3	0	0	3	40	60	100
			Operation Research-I	UMA26S02	3	0	0	3	40	60	100
	IV	DEC	Disciplinary Elective Course -X	UMA26010	4	0	0	4	40	60	100
			Disciplinary Elective Course -XI	UMA26011							
			Disciplinary Elective Course -XII	UMA26012							
	V	EE	Experiential Elective (Internship)	UMA5EE01	2	0	0	2	*	*	100
								27			800

SEMESTER-VI

Semester	Part	Course Category	Title of the Course	Course Code	L	T	P	Credits	Marks		
									CAT	ESE	Total
VI	III	Core	Linear Algebra	UMA26614	4	0	0	4	40	60	100
		Core	Complex Analysis	UMA26615	4	0	0	4	40	60	100
		Core	Project	UMA26616	0	0	10	5	40	60	100
		DEC	Disciplinary Elective Course -XIII	UMA26013	3	0	0	3	40	60	100
			Disciplinary Elective Course -XIV	UMA26014							
			Disciplinary Elective Course -XV	UMA26015							
		SEC	Operation Research-II	UMA26S03	3	1	0	4	40	60	100
			Graph Theory	UMA26S04	3	1	0	4	40	60	100
	IV	DEC	Disciplinary Elective Course -XVI	UMA26016	3	0	0	3	40	60	100
			Disciplinary Elective Course -XVII	UMA26017							
			Disciplinary Elective Course -XVIII	UMA26018							
	V	VAC	Non-Major Compulsory (GS)	UVA26005	2	0	0	2	40	60	100
								29			800

Multidisciplinary Course offered to other Departments:

UMA26901 - Algebraic and Numerical Statistics

UMA26902 - Algebra and vector Calculus

UMA26903 - Operation Research

UMA26904 - Probability and Statistics

UMA26905 – Business Mathematics

UMA26906 – Business Statistics

UMA26907 – Biostatistics

UMA26908 – Lab in Biostatistics

UMA26909 - Business Operations Analysis

Disciplinary Elective Course Offered by the Department:

UMA26001 - Industrial Statistics I

UMA26002 - Financial Mathematics

UMA26003 – Number Theory

UMA26004 - Industrial Statistics II

UMA26005 - Integral Transform

UMA26006 – Statistical Time Series and Index Theory

UMA26007 - Statics

UMA26008 – Astronomy-I

UMA26009 - Cryptography

UMA26010 - Astronomy-II

UMA26011 - Fuzzy Set Theory and its Applications

UMA26012 - Classical Mechanics

UMA26013 - Dynamics

UMA26014 – Mathematical Aptitude and Logical Reasoning

UMA26015 – Algebraic Structures

UMA26016 – Tensor Analysis

UMA26017 – Lattice and Boolean Algebra

UMA26018 - Elements of Discrete Mathematics

Semester-wise Categorization of Courses

COURSE CATEGORY	Semester						No of Courses	Total Credits
	I	II	III	IV	V	VI		
Ability Enhancement Course	2	2	2	2	-	-	8	24
MSC-Core Courses (Theory & Practicals)	3	3	2	2	3	3	16	53
MDC–Multi Disciplinary Course	1	1	1	1	-	-	4	12
DEC–Disciplinary Elective Course	-	-	1	1	2	2	6	20
SEC–Skill Enhancement Course	-	-	-	-	2	2	4	14
VAC-Value Added Course	1	1	1	1	-	1	5	12
EE–Experiential Elective	-	-	-	-	1	-	1	2
Total Courses Per Semester	7	7	7	7	8	8	44(Courses)	
Total Credits	20	20	21	20	27	29	137(Credits)	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
I	UMA26101	Analytical Geometry(3D)	Core	3	0	0	3

Pre-Requisite: Nil

Co- Requisite: Nil

Progressive Course: Nil

Course Objectives:

1. Explain the basic concepts of distance, direction ratios, direction cosines, and angles between lines.
2. Describe the equations and properties of planes and solve simple plane-related problems.
3. Explain the equations of straight lines and determine the relationship between a line and a plane.
4. Identify coplanar and skew lines and calculate the shortest distance between two lines.
5. Explain the equations and properties of spheres and cones and solve simple problems involving tangent planes and normals.

Course Outcomes:

CO1:**Explain** the concepts of distance, direction ratios, direction cosines, and angles between lines in three-dimensional geometry. **(K2)**

CO2:**Describe** the equations and properties of planes and **apply** them to solve simple problems. **(K3)**

CO3:**Apply** the equations of straight lines to determine the relationship between a line and a plane **(K3)**.

CO4:**Calculate** the shortest distance between two lines and **identify** coplanar and skew lines. **(K1)**

CO5 :**Explain** the equations of spheres and cones and **solve** simple problems involving tangent planes and normals. **(K2)**

Unit-I 9 Hrs.

Distance between two points, Projections, direction ratio and direction cosines of a joining two points – Angle between the lines, Conditions for perpendicularity and parallelism.

Unit-II 9 Hrs.

The plane -The Equation of the plane passing through the points -Angle between two planes – Length of the perpendicular – Bisecting plane.

Unit-III 9 Hrs.

The Straight line–Symmetric form–Equation of a straight line passing through two given points – The plane and the straight line – Angle between a plane and a straight line.

Unit-IV 9 Hrs.

Coplanar lines–Shortest distance between two lines –Skew lines.

Unit-V 9 Hrs.

The Sphere– Equation of a sphere –Equation of the tangent plane – Simple problems – Cone – Right Circular Cone – Tangent plane and normal..

Text Book(s):

1. T.K.Manicavachagom Pillay & T.Natarajan Analytical Geometry of Three dimensions, S.Viswanathan Printers, Revised Edition – 1996, Reprint 2001.

Reference Book(s):

1. Dr. S. Arumugam and A.T. Issac. Analytical Geometry 3D and Vector Calculus, New Gamma Publishing House, Edition Jan 2011
2. Analytical Solid Geometry – **Shanti Narayan and P.K. Mittal**, S. Chand & Company Ltd., New Delhi.
3. Analytical Geometry of Three Dimensions – S. Viswanathan Publishers Pvt. Ltd., Chennai.

e Resources:

1. <https://nptel.ac.in/courses/111>
2. <https://ocw.mit.edu/courses/mathematics/>
3. <https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx>
4. <https://www.khanacademy.org/math>
5. <https://www.geogebra.org/3d>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
I	UMA26101			ANALYTICAL GEOMETRY(3D)								3	0	0	3
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	2	1	1	0	0	0	1	0	2	3	2	2	
CO2	3	3	2	2	2	0	0	0	1	0	2	3	2	2	
CO3	3	3	3	2	2	0	0	0	1	0	2	3	2	2	
CO4	3	3	2	2	1	0	0	0	1	0	2	3	2	2	
CO5	3	3	2	2	2	0	0	0	1	0	2	3	2	2	
Mean Score	3	3	2	2	2	0	0	0	1	0	2	3	2	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
I	UMA26102	Analytical Geometry using Geogebra (P)	Core (Practical)	0	0	4	2

Pre-Requisite:Nil

Co- Requisite:Nil

Progressive Course:Nil

Course Objectives:

- 1.Explain the basic concepts of analytical geometry in two dimensions.
- 2.Describe the properties of straight lines in three-dimensional geometry.
- 3.Explain the equations and properties of spheres and circles.
- 4.Describe the equations and properties of cones and cylinders.
- 5.Use Scilab to perform basic mathematical calculations and create 2D and 3D plots.

Course Outcomes:

CO1:**Define** the basic concepts of analytical geometry in 2D, including polar equations, directrix, tangent, normal, and chord. **(K1).**

CO2:**Explain** the concepts of straight lines in 3D, coplanarity, and the shortest distance between two lines**(K2)**

CO3:**Apply** the equations of spheres to determine tangent lines, tangent planes, and circles. **(K3)**

CO4:**Apply** the equations of cones and cylinders to solve simple geometrical problems. **(K3)**

CO5: **Use**Scilab to perform basic mathematical computations and generate 2D and 3D plots. **(K3).**

Unit-I	Analytical geometry of 2D	12 Hrs.
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Analytical geometry of 2D-Polar Equations-directrix-chord tangent-normal-Problems..

Unit-II	Analytical Geometry 3D	12 Hrs.
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Analytical Geometry 3D-straight lines-coplanarity of straight-line-shortest distance(S.D)And equation of S.D between two lines.

Unit-III	Sphere	12 Hrs.
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Sphere: Equation of a sphere–Tangent line –Tangent plane –Sections of the sphere- equation of a circle.

Unit-IV	Cone and cylinder	12 Hrs.
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Cone and cylinder: Equation of a Cone-right circular cone-Equation of a cylinder-right circular Cylinder.

Unit-V	Introduction to Scilab	12 Hrs.
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Introduction to Scilab-Installation process-Scilab functions-Features of Scilab-plotting-plotting Vectors 2D & 3D.

Text Book(s):

- 1.P.Durai Pandian & Kayalal Pachaiyappa,“Analytical Geometry 2D”,Emerald Publishers,Chennai. 2009.[Unit I].
2. P.Durai Pandian & Kayalal Pachaiyappa,“Analytical Geometry 3D”,Emerald Publishers,Chennai. 2009. [Unit II to Unit IV].
3. Er.Hema Ramachandran and Achuthsankar S Nair“Scilab (A free Software to Matlab)”1st edition S.Chand and Company 2015

Reference Book(s):

1. T.K.M.Pillai and Others “Analytical Geometry of 2D” – Viswanathan Publications-2010
 2. T.K.M.Pillai and Others “Analytical Geometry of 3D” – Viswanathan Publications-2009
- Johnny Heikell Scilab for real Dummies

e Resources:

1. https://www.youtube.com/watch?v=nu1_FEyoYgk
2. https://www.youtube.com/watch?v=1V_vB8IJQ1w
3. <https://www.youtube.com/watch?v=lJbeINHrjHk>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26102			Analytical Geometry using Geogebra								0	0	4	2
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	1	0	0	0	0	0	1	0	1	3	1	1	
CO2	3	3	2	0	0	0	0	0	1	0	1	3	2	2	
CO3	3	3	2	1	1	0	0	0	1	0	1	3	2	2	
CO4	3	3	2	1	1	0	0	0	1	0	1	3	2	2	
CO5	2	2	2	1	3	0	0	0	2	1	1	2	3	2	
Mean Score	2	3	2	1	1	1	0	0	1	0	1	3	2	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
I	UMA26103	Classical Algebra	Core Course	3	1	0	4
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives: <ol style="list-style-type: none"> 1. Understand the basic concepts of sets, functions, and their operations.. 2. Explain partially ordered sets, lattices, and Boolean algebra. 3. Understand relations, equivalence relations, mathematical induction, and cardinality of sets. 4. Apply matrix operations to solve systems of equations and determine eigenvalues and eigenvectors. 5. Explain the basic concepts of number theory, including divisibility, congruence, and prime numbers.. 							
Course Outcomes:							
CO1 :Explain the basic concepts of number theory, including divisibility, congruence, and prime numbers. (k1)							
CO2: Explain the concepts of partially ordered sets, lattices, distributive lattices, modular lattices, and Boolean algebra. (K2)							
CO3: Apply the concepts of relations, equivalence relations, mathematical induction, and cardinality of sets to solve simple problems. (K3).							
CO4: Apply matrix operations, inverse matrices, eigenvalues, eigenvectors, and the Cayley–Hamilton theorem to solve linear algebra problems. (K3).							
CO5 :Apply the concepts of divisibility, congruence relations, Euler's function, Fermat's theorem, and Wilson's theorem to solve number theory problems. (K3)							
Unit-I	SETS & FUNCTIONS						12Hrs.
Basic terminologies – Operations on sets – Family of sets – Power sets – Cartesian product of sets.- Basic definitions: one-one, onto functions and bijections – Composition of functions – Inverse of a function..							
Unit-II	LATTICES						12 Hrs.
Partially ordered sets – Lattices -Distributive Latices – Modular Lattices – Boolean Algebra.							
Unit-III	RELATION						12Hrs.
Relation on sets – Types of relations – Equivalence relations – Equivalence classes and partitions of a set – The induction principle – Sets with same cardinality – Finite sets – Countable sets – Comparing cardinality.							
Unit-IV	MATRIX						12 Hrs.
Types of matrices- Operations on Matrices- Inverse Matrix Solution of simultaneous equations- Rank of a matrix- Homogeneous and Non-homogeneous linear equations- Eigen values and Eigen vectors – Diagonalization- Cayley-Hamilton theorem.							
Unit-V	THEORY OF NUMBERS						12Hrs.
Prime Numbers and Composite Numbers - Euler’s function - Divisibility and Congruence relations - Fermat’s theorem - Wilson’s theorem.							
Text Book(s): <ol style="list-style-type: none"> 1. Ajit Kumar, S. Kumaresan, &Bhaba Kumar Sarma, A Foundation Course in Mathematics, Narosa Publishers, New Delhi, 2018. 2. T. K. Manicavachagom Pillay, T. Natarajan, K. S. Ganapathy, Algebra, Vol. 2, S. Viswanathan Publications (India) Pvt. Ltd., Chennai, 2012. 							

Reference Book(s):

1. A Shen and NK Vereshchagin, Basic Set Theory, AMS Students Mathematical Library, USA, 2002.
2. Paul R. Halmos, Naive Set Theory, Springer, New York, 1974.
3. David M. Burton, Elementary Number Theory, 7th Edition, McGraw Hill, New Delhi, 2012.
4. S. Arumugam & A. T. Isaac, Modern Algebra, SciTech Publications, India Pvt. Ltd., Chennai, 2003.
5. S. Narayanan & T. K. Manicavachagom Pillay, Modern Algebra, Vol-I, S. Viswanathan Pvt. Ltd., Chennai, 1997.

e Resources:

1. <http://nptel.ac.in/courses/109104124/>
2. <https://nptel.ac.in/courses/111/106/111106142/>
3. <https://nptel.ac.in/courses/111/105/111105112/>
4. www.maths.manchester.ac.uk/~avb/0n1_pdf/0N1_All.pdf
5. <https://4dspace.mts.org.in/expository-articles-list.php>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
I	UMA26103			CLASSICAL ALGEBRA								3	1	0	4
Course Outcomes (COs)	Programme Outcomes(POs)											Programm e Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	1	0	0	1	0	0	0	1	0	1	3	1	1	
CO2	3	2	0	1	2	0	0	0	1	0	1	3	2	1	
CO3	3	3	2	2	2	0	0	1	1	1	2	3	2	2	
CO4	3	3	2	2	3	0	0	1	1	2	2	3	3	2	
CO5	3	3	2	2	2	0	0	0	1	1	2	3	2	2	
Mean Score	3	2	1	1	2	0	0	0	1	1	2	3	2	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26204	Calculus	Core	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			

Course Objectives:

1. The student **understands** limits, continuity, differentiation techniques, and the applications of mean value theorems.
2. The student **applies** successive differentiation, Leibnitz theorem, and concepts of curvature and maxima and minima.
3. The student **evaluates** definite integrals using integration techniques, reduction formulae, and the limit of a sum.
4. The student **calculates** double and triple integrals and **uses** Jacobians for change of variables.
5. The student **determines** the length of curves, areas, volumes, and surface areas using integration.

Course Outcomes:

CO1:**Recall** the concepts of limits, continuity, differentiation, and the fundamental theorems of differential calculus. **(K1)**

CO2: **Explain** the methods of successive differentiation, Leibnitz theorem, maxima and minima, and curvature of curves.**(K2)**

CO3:**Apply** techniques of definite integration, integration by parts, and reduction formulae to solve mathematical problems.**(K3)**

CO4:**Apply** double and triple integrals, Jacobians, and change of variables in evaluating multiple integrals.**(K3)**

CO5:**Apply** integration methods to determine the length of curves, areas, volumes, and surface areas of solids.**(K3)**

Unit-I	Differentiation	9 Hrs.
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Limits and continuity -Standard forms-Logarithmic differentiation-Transformation, Rolle's theorem- Mean value theorem-Generalised mean value theorem

Unit-II	Differential Calculus	9 Hrs.
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Methods of Successive Differentiation - Leibnitz theorem and its applications – Maxima and Minima of two variables-Curvature- Radius of Curvature in cartesian and polar coordinates - Centre of Curvature - Evolutes and Involutives.

Unit-III	Integral Calculus	9 Hrs.
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Evaluation of Definite integrals-Integration by parts -Reduction formulae - Integration as the limit of a sum.

Unit-IV	Double and Triple integrals	9 Hrs.
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Double Integrals- Evaluation of double integrals- Triple integrals- Jacobians- Change of variables in double and Triple integrals.

Unit-V	Application of Integration	9 Hrs.
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Length of a curve- Area- Volume of a solid of revolution – Surface area of a solid of revolution– Volume as Triple integral- Area of surfaces.

Text Book(s):

1. S.Narayanan&T.K.Manickavasagam Pillai,Calculus,Vol.1.S.Viswanathan Pvt.Ltd.,Chennai, 2004.
2. S.Arumugam&A.Thangapandi Isaac,Calculus,Vol.2.,New Gamma Publishing House, Palayamkottai, 1999.

Reference Book(s):

1. George B. Thomas, JR & Ross L. Finney, *Calculus and Analytic Geometry*, Sixth edition, Narosa Publishing House, New Delhi, 1986.
2. S. Arumugam & A. Thangapandi Isaac, *Calculus*, Vol. 1, New Gamma Publishing House, Palayamkottai, 1999
3. Shanti Narayan and P. K. Mittal, *Integral Calculus*, S. Chand Publishing.
4. Thomas, G. B., Weir, M. D., and Hass, J., *Thomas' Calculus*, Pearson.
5. Stewart, J., *Calculus: Early Transcendentals*, Cengage Learning.

e Resources:

1. <https://freevideolectures.com/course/2502/calculus>
2. <https://freevideolectures.com/course/2071/calculus-i-key-concepts>
3. <https://www.khanacademy.org/math/calculus-1> Khan Academy Calculus 1
4. <https://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx> Paul's Online Math Notes – Calculus I
5. <https://openstax.org/details/books/calculus-volume-1> OpenStax Calculus Volume 1

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26204			CALCULUS								3	0	0	3
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	1	-	-	-	-	-	-	-	2	3	1	2	
CO2	3	3	2	1	-	-	-	-	1	-	2	3	2	2	
CO3	3	3	2	1	1	-	-	-	-	1	2	3	3	2	
CO4	3	3	3	1	2	-	-	-	-	1	2	3	3	2	
CO5	3	3	2	2	1	1	-	-	-	1	2	3	2	2	
Mean Score	3	3	2	1	1	1	-	-	1	1	2	3	2	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26205	Calculus using SCILAB	Core (Practical)	0	0	4	2
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives: <ol style="list-style-type: none"> Students understand successive differentiation, curvature concepts, and the basic operations and plotting features in Scilab. Students apply properties of definite integrals, integration techniques, reduction formulae, and simple Scilab programs. Students evaluate double and triple integrals in Cartesian and polar coordinates and implement simple Scilab programs. Students analyze Beta and Gamma functions, their properties and relationships, and use Scilab to solve related problems. Students apply Jacobians and coordinate transformations in multiple integrals and develop simple Scilab programs for computational applications. 							
Course Outcomes:							
CO1: Recall the concepts of successive differentiation, Leibnitz theorem, curvature, radius of curvature, centre of curvature, and the basic features of Scilab. (K1)							
CO2: Explain the properties of definite integrals, integration by parts, reduction formulae, Bernoulli's formula, and the use of simple Scilab programs. (K2)							
CO3: Apply double and triple integrals in Cartesian and polar coordinates to solve mathematical problems using Scilab. (K3)							
CO4: Explain the properties of Beta and Gamma functions and their relationship, and apply Scilab to solve related problems. (K2/K3)							
CO5: Apply Jacobians and coordinate transformations in evaluating multiple integrals and use Scilab for computational applications. (K3)							
Unit-I	Differential Calculus and Introduction to Scilab						12 Hrs.
Successive Differentiation-Leibnitz theorem and its applications–Curvature–Radius of Curvature and Centre of Curvature-Introduction to Scilab-Working with Scilab-Plotting							
Unit-II	Integral Calculus						12 Hrs
Properties of definite integrals - Integration by parts – Reduction Formulae-Bernoulli's formula- Scilab Simple Program							
Unit-III	Multiple Integrals						12 Hrs
Definition of double integral-Evaluation of double integral-double integral in polar Coordinates- Triple integrals- Scilab Simple Program							
Unit-IV	Improper Integrals:						12 Hrs.
Beta and Gamma integrals-properties–problems-relation between Beta and Gamma functions-Scilab Simple Program							

Unit-V	Change of Variables	12 Hrs.
Jacobian-Change of variable in the case of two variables and three variables–Transformation from Cartesian to polar coordinates – Spherical polar co-ordinates -- Scilab Simple Program		

Text Book(s):

- 1.Narayanan S. and Manicavasagam Pillay T. K, Calculus Volume - I, S. Viswanathan Pvt. Ltd, 2010.
- 2.NarayananS.andManicavasagamPillayT.K,CalculusVolume -II,S.ViswanathanPvt.Ltd,2010.
- 3.Introduction to Scilab: For Engineers and Scientists, Sandeep Nagar, Apress, First edition, 2018.

Reference Book(s):

- 1.Calculus(2ndEdition),Lipman Bers and Frank Karal, Holt McDougal, 1976.
- 2.Thomas'Calculus12thEdition,GeorgeB.Thomas,MauriceD.WeirandJoelHass,Pearson Education, 2015.
- 3.Integral Calculus, N.P.Bali ,Laxmi Publications, Delhi,(1991)
- 4.Shanthinarayan and PKMittal, Integral Calculus, Reprint. NewDelhi: S.Chand and Co.Pvt.Ltd., 2013
- 5.NPBali, Differential Calculus, India: Laxmi Publications(P)Ltd...,2010

e Resources:

- 1.www.scilab.org<https://www.khanacademy.org/math/calculus-1>
- 3.<https://ocw.mit.edu/courses/18-01sc-single-variable-calculus-fall-2010/>
- 4.https://onlinecourses.nptel.ac.in/noc21_ma16/preview

Relationship Matrix for COs, POs and PSOs

Relationship Matrix for COs, POs and PSOs															
Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26205			Calculus Using SCILAB								0	0	4	2
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	1	-	2	-	-	-	-	-	2	3	2	2	
CO2	3	3	2	-	2	-	-	-	1	-	2	3	3	2	
CO3	3	3	3	1	3	-	-	-	1	1	2	3	3	2	
CO4	3	3	2	1	3	-	-	-	1	-	2	3	3	2	
CO5	3	3	3	2	3	-	-	-	1	1	2	3	3	2	
Mean Score	3	3	2	1	3	-	-	-	1	1	2	3	3	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26206	Theory of Equations & Trigonometry	Core (Theory)	3	1	0	4
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives: <ol style="list-style-type: none"> Students understand the fundamental concepts of polynomial equations, theorems, and the relationships between roots and coefficients. Students apply transformation techniques to simplify and solve algebraic equations. Students analyze algebraic equations using Descartes' Rule, Rolle's Theorem, Sturm's Theorem, Newton's Method, and Horner's Method. Students derive trigonometric expansions and solve problems involving powers and identities of trigonometric functions. Students apply the properties of hyperbolic functions, inverse hyperbolic functions, and complex logarithms to solve mathematical problems. 							
Course Outcomes:							
CO1: Recall the fundamental concepts of polynomial equations, theorems, and the relationships between roots and coefficients. (K1)							
CO2: Explain the methods of transforming algebraic equations and the techniques for simplifying and solving them. (K2)							
CO3: Apply Descartes' Rule of Signs, Rolle's Theorem, Sturm's Theorem, Newton's Method, and Horner's Method to determine and analyze the roots of equations. (K3)							
CO4: Apply trigonometric expansions and identities to solve mathematical problems involving powers and multiple angles. (K3)							
CO5: Explain the properties of hyperbolic functions, inverse hyperbolic functions, and complex logarithms and apply them to solve mathematical problems. (K2/K3)							
Unit-I	Theory of Equations						12 Hrs.
Theory of Equations: Remainder Theorem-Fundamental Theorem of Algebra- Relations between roots and coefficients - Symmetric functions of roots.							
Unit-II	Transformation and Solution of Algebraic Equations						12 Hrs.
Transformation of Equations - Reciprocal Equations –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.							
Unit-III	Methods for Finding and Analyzing Roots of Equations						12 Hrs.
Descartes' rule of signs – Rolles' Theorem – Strum's Theorem - Newton's Method of Divisors — Horner's Method.							
Unit-IV	Trigonometric Expansions and Identities						12 Hrs.
Trigonometry: Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ —Powers of sines and cosines of θ —Expansions of $\sin^n \theta$, $\cos^n x$, $\sin \theta$ and $\cos \theta$ Properties and their related problems.							
Unit-V	Hyperbolic Functions and Complex Logarithms						12 Hrs.
Hyperbolic functions-Inverse hyperbolic functions-Logarithm of Complex Quantities.							

Text Book(s):

1. T. K. Manicavachagom Pillay, T. Natarajan & K. S. Ganapathy, Algebra, Vol. 1, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2014.
2. S. Narayanan & T. K. Manicavachagom Pillay, Trigonometry, S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2001.

Reference Book(s):

1. Arumugam & Issac, Theory of Equations, Theory of Numbers and Trigonometry, New gamma Publishing house, Tirunelveli, 2011.

e Resources:

1. <https://www.youtube.com/watch?v=V4fCrkWJ8tc>
2. <https://www.youtube.com/playlist?list=PLOnJQiDsowoiyJH7qgTXkLjeVOzlVvumh>
3. <https://cosmolearning.org/courses/trigonometry-complex-numbers/>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26206			Theory of Equations & Trigonometry								3	1	0	4
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	1	1	-	-	-	-	-	1	-	1	3	1	2	
CO2	3	2	1	1	1	-	-	-	1	1	1	3	2	3	
CO3	3	3	2	1	2	-	-	1	1	1	2	3	3	3	
CO4	3	3	1	1	1	-	-	-	1	1	2	3	2	3	
CO5	3	2	1	1	2	-	-	-	1	1	2	3	2	3	
Mean Score	3	2	1	1	1	-	-	1	1	1	2	3	2	3	

MULTI-DISCIPLINARY COURSE

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
I	UMA26901	Algebraic and Numerical Statistics	Multi Disciplinary Course	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives:							
1. Explain the relationship between the roots and coefficients of polynomial equations and perform							
2. Apply numerical methods to differentiate, integrate, and solve ordinary differential equations.							
3. Solve systems of linear equations using direct and iterative numerical methods.							
4. Compute and interpret measures of central tendency and measures of dispersion for statistical data..							
5. Determine and interpret the degree of correlation between variables using Karl Pearson's and Spearman's rank correlation methods..							
Course Outcomes:							
CO1: Explain the relation between roots and coefficients, symmetric functions of roots, and transformations of algebraic equations. (K2)							
CO2: Apply numerical differentiation, numerical integration, and numerical methods to solve ordinary differential equations. (K3).							
CO3 Apply Gaussian Elimination, Jacobi, and Gauss–Seidel iterative methods to solve systems of linear equations. (K3)							
CO4: Explain the concepts of measures of central tendency and measures of dispersion, and calculate their values for statistical data. (K2).							
CO5: Interpret the relationship between variables by calculating Karl Pearson's and Spearman's rank correlation coefficients. (K3).							
Unit-I							9 Hrs.
Relation between roots & coefficients – Symmetric function of the roots – Formulation of equation -Transformations of Equations – Diminishing, Increasing & multiplying the roots by a constant.							
Unit-II							9 Hrs.
Numeri differentiation- Numerical Integration using Trapezoidal rule and Simpson’s 1/3rd& 3/8th rules (proof not needed) – Numerical solution of ODE: Solution by Taylor Series Method, Euler’s Method, Runge –Kutta2 nd and 4 th ordermethod.							
Unit-III							9 Hrs.
Gaussian Elimination Method –Jacobi & Gauss Seidel iterative methods–problems							
Unit-IV							9 Hrs.
Arithmetic Mean - Median, Mode, Geometric mean, Harmonic mean, Range, Quartile Deviation, Standard Deviation, Coefficient of variance.							
Unit-V							9 Hrs.
Correlation: Meaning of Correlation, Limits for Correlation Coefficient - Types of Correlation, Coefficient of correlation–Karl’s Pearson & Spearman’s Rank Correlation							

Text Book(s):

1. T.K.Manickavasagam Pillai & others, Algebra, Volume I, S.V Publication, 1985 Revised Edition.
2. S.S.Sastry, Introductory methods of Numerical Analysis, 3rd Edition, New Delhi, Sep 1999.
3. Gupta. S.C & Kapoor, V.K, Fundamentals of Mathematical Statistics, Sultan Chand & sons, New Delhi-1994.

Reference Book(s):

1. Arumugam and Issac, Classical Algebra, New gamma Publishing house, Tirunelveli, 2003
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Private Limited, 1999.
3. C.E.Froberg, Introduction to Numerical Analysis, II Edition., Addison Wesley, 1979

e Resources:

1. <https://archive.org/details/algebra0001manic>
2. <https://books.google.com/books?id=PZ0zEAAQBAJ>
3. <https://www.sviswanathan.com>
4. <https://www.nationallibrary.gov.in>
5. https://annamalaiuniversity.ac.in/affcl/download/syllabus_revised_ug_2023-24/

Relationship Matrix for COs, POs and PSOs

Semester	Course code		Title of the course									L	T	P	Credit
I	UMA26901		Algebraic and Numerical Statistics									3	0	0	3
Course Outcomes (COs)	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	1	1	2	0	0	0	1	0	1	3	2	1	
CO2	3	3	2	2	3	0	0	1	1	2	2	3	3	2	
CO3	3	3	2	2	3	0	0	1	1	2	2	3	3	2	
CO4	3	2	2	1	2	0	0	0	1	1	2	3	3	2	
CO5	3	3	2	2	2	0	0	0	1	1	2	3	3	2	
Mean Score	3	3	2	2	2	0	0	0	1	1	1	3	3	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
I	UMM26902	Algebra and vector Calculus	Multi Disciplinary Course	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives:							
1. Understand the fundamental concepts of matrices and linear systems. 2. Analyze polynomial equations, their roots, and transformations. 3. Apply the concepts of sets, relations, and functions in mathematical problem-solving. 4. Develop proficiency in vector differentiation and vector field analysis. 5. Apply vector integration techniques to solve problems in mathematics and physics.							
Course Outcomes:							
CO1: Understands solution of system of equations using matrices							
CO2: Analyze quadratic form using matrix.							
CO3: Apply differentiation techniques to find extreme values of functions.							
CO4: Calculate curvature of curve using differentiation techniques.							
CO5: Relate vector spaces with magnetic field and moving fluid							
Unit-I	Linear Algebra: Matrices						9Hrs.
Matrices: Basics of Matrix -,Linear Systems of Equations, Rank of a Matrix, Inverse of a Matrix, Eigen values, Eigen vectors, characteristic equations -Cayley's Hamilton Theorem – simple problems							
Unit-II	Theory of Equation						9Hrs.
Relation between roots & coefficients – Symmetric function of the roots – Formulation of equation -Transformations of Equations – Diminishing, Increasing & multiplying the roots by a constant.							
Unit-III	Sets & Functions						9Hrs.
Introduction-Union of the Sets-Intersection of Sets- Difference of Sets-Cartesian Product of Sets- Relations: Equivalence Relations- Function-Types of Function.							
Unit-IV	Vector Differentiation						9Hrs.
Differentiation of vectors–Velocity and acceleration-Vector and Scalar Fields–Gradient of a vector–directional derivatives-Divergence-Curl of a vector Solenoidal and irrotational vectors-Laplacian double operators-simple problems							
Unit-V	Vector Integration						9Hrs.
Vector integration – Tangential line integral – Conservative force field – scalar potential - Work done by a force - Normal surface integral- Volume integral – simple problems							

Text Book(s):

- 1.S.Arumugam,A.Thangapandi Isaac, “Modern Algebra”,Scitech Publications Private Limited,Chennai, 2019
- 2.M.L. Khanna, Vector Calculus, Jai Prakash Nath and Co., 8th Edition, 1986
3. T. K. Manicavachagom Pillay, T. Natarajan, K. S. Ganapathy, Algebra, Vol. 2, S. Viswanathan Publications (India) Pvt. Ltd., Chennai, 2012

Reference Book.

1. D.Poole,“LinearAlgebra:AModernIntroduction”,2ndEdition,Brooks/Cole,2005.
2. Duraipandian, P.Duraipandiyan and Lakshmi Vector Analysis, Emerald publishers (1986).
3. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. III, S. Viswanathan Pvt Limited, and Vijay Nicole Imprints Pvt Ltd, 2004.

e Resources:

1. <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/>
2. <https://openlearninglibrary.mit.edu/>
3. <https://www.khanacademy.org/math/linear-algebra>
4. <https://tutorial.math.lamar.edu/>
5. <https://www.khanacademy.org/math/multivariable-calculus>
6. <https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.asp>

Relationship Matrix for COs, POs and PSOs

Semester	Course code	Title of the course											L	T	P	Credit
I	UMA26902	Algebra and vector Calculus											3	0	0	3
Course Outcome s (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs		
	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2			
CO1	2	3	3	2	2	2	3	2	-	-	-	3	2	2		
CO2	2	1	2	3	2	2	3	2	-	-	-	3	2	2		
CO3	2	2	1	2	3	3	3	2	-	-	-	3	2	2		
CO4	1	2	2	2	2	3	2	3	-	-	-	3	3	2		
CO5	2	2	2	1	3	3	2	2	-	-	-	3	2	2		
Mean Score	2	2	2	2	2	3	3	2	-	-		3	2	2		

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26903	Operation Research	Multi Disciplinary Course	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives: <ol style="list-style-type: none"> 1. To introduce the fundamental concepts and applications of Operations Research in decision-making and optimization 2. To develop the ability to solve game theory problems using pure and mixed strategies and graphical methods. 3. To provide knowledge of transportation and assignment models for optimizing resource allocation. 4. To enable students to analyze and solve sequencing problems for efficient scheduling of jobs and machines. 5. To familiarize students with network analysis techniques such as PERT and CPM for project planning, scheduling, and resource management. 							
Course Outcomes:							
CO1: Define the fundamental concepts of Operations Research, decision-making, linear programming, and standard forms of LPP. (K1)							
CO2: Explain the principles of game theory, including pure and mixed strategies, dominance property, and graphical methods. (K2)							
CO3: Apply transportation and assignment techniques such as the North-West Corner Method, Least Cost Method, Vogel's Approximation Method, and Hungarian Method to solve optimization problems. (K3)							
CO4: Apply sequencing algorithms to determine the optimal processing order of jobs through two machines, three machines, and multiple machines. (K3)							
CO5: Explain network analysis techniques, including Fulkerson's rule, PERT, CPM, and resource scheduling, for project planning and control. (K2)							
Unit-I	Operations Research						9 Hrs.
Introduction - Basics of OR – Role of Computers in OR - OR & decision making – Linear programming formulations & graphical solution of two variables–Canonical & standard forms of LPP.							
Unit-II	Game Theory						9Hrs.
Introduction-Game with Pure Strategies-Game with Mixed Strategies -Dominance Property- Graphical Method For 2xn Or Mx2 Games							
Unit-III	Transportation problem						9 Hrs.
Introduction, Mathematical formulation – Definitions - North West Corner Method – Least Cost Method – Vogel’s Approximation Method-Assignment Problem: Hungarian assignment problem.							
Unit-IV	Sequencing problem						9 Hrs.
Processing of n jobs through two machines–Processing of n jobs through 3 machines – Problems with two jobs through K machines.							
Unit-V							9 Hrs
Network–Fulkerson’s rule-measure of activity–PERT computation–CPM computation-Resource scheduling.							

Text Book(s):

1. S.Kalavathy, Operations Research Vikas Publishing House Pvt Ltd.
2. Paneer Selvam, Operation Research PHI Learning Pvt. Ltd.

Reference Book(s):

1. Prem Kumar Gupta and D.S. Hira, Operations Research: An Introduction, S.Chand and Co., Ltd. New Delhi,
2. Hamdy A. Taha, Operations Research (7th Edition.), McMillan Publishing Company, New Delhi, 1982.
3. Manmohan & Gupta, Operations Research, Sultan Chand Publishers, New Delhi

e Resources:

1. https://onlinecourses.nptel.ac.in/noc22_mg30/preview
2. <https://ocw.mit.edu/>
3. <https://ndl.iitkgp.ac.in/>
4. <https://www.vlab.co.in/>
5. <http://web.iitd.ac.in/~dharmar/virtuallab/>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26903			Operation Research								3	0	0	3
Course Outcome s (COs)	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	1	-	-	-	-	-	-	1	1	3	1	1	
CO2	2	3	2	1	-	-	-	-	1	1	2	2	2	1	
CO3	2	3	3	2	2	-	-	-	1	2	2	3	3	2	
CO4	2	3	3	2	2	-	-	-	1	2	2	3	2	2	
CO5	2	3	3	2	2	-	-	1	1	2	2	2	3	2	
Mean Score	2	3	2	1	1	0	0	0	1	2	2	3	2	1	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26904	Probability And Statistics	MDC–Multi Disciplinary Course	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course:Nil			

Course Objectives:

1. **Explain** the basic concepts of probability, conditional probability, and the additive and multiplicative laws of probability.
2. **Apply** tests of significance to analyze hypotheses for means and proportions using large sample tests.
3. **Calculate** and **interpret** the measures of central tendency, including arithmetic mean, median, mode, geometric mean, and harmonic mean.
4. **Compute** and **interpret** the measures of dispersion, including range, quartile deviation, mean deviation, standard deviation, and coefficient of variation.
5. **Determine** and **interpret** the relationship between variables using Karl Pearson's and Spearman's rank correlation coefficients.

Course Outcomes:

CO1:**Explain** the basic concepts of probability, conditional probability, and the additive and multiplicative laws of probability. (K2)

CO2:**Apply** large sample tests to test hypotheses for means and proportions. (K3)

CO3:**Explain** the concepts of measures of central tendency and **calculate** arithmetic mean, median, mode, geometric mean, and harmonic mean for given data. (K2)

CO4:**Apply** the measures of dispersion to compute and interpret variability in statistical data. (K3)

CO5: **Interpret** the relationship between variables by **calculating** Karl Pearson's and Spearman's rank correlation coefficients. (K3).

Unit-I	Probability	9 Hrs
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Definition, axiomatic approach to probability – Additive and Multiplicative laws of Probability (two variables only) and Conditional probability–simple problems

Unit-II	Test of significance	9 Hrs
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Definition of null hypothesis, alternative hypothesis, Type I and Type II errors, one tailed and two tailed tests. Large sample test for single mean, Difference between means, single proportion and difference between proportions.

Unit-III	Measures of Central Tendency	9 Hrs
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Arithmetic Mean, Median, Mode, Geometric mean and Harmonic mean.

Unit-IV	Measures of Dispersion-	9 Hrs
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Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of variance.

Unit-V	Correlation	9 Hrs
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Meaning of Correlation, Limits for Correlation Coefficient - Types of Correlation, Coefficient of correlation–Karl's Pearson & Spearman's Rank Correlation.

Text Book(s):

1. Gupta.S.C&Kapoor,V.K,Fundamentals of Mathematical Statistics,Sultan Chand&sons, New Delhi-2002.

Reference Book(s):

1. Gupta S.C. and Kapoor V.K: Fundamentals of Applied Statistics–Sultan Chand & Sons.
2. S.P.Gupta, Statistical Methods (Revised edition 2001)
3. R.S.N.Pillai and Bagavathi, Practical statistics, Second edition (2013)

e Resources:

1. <https://www.edx.org/learn/probability>
2. <https://www.khanacademy.org/math/statistics-probability>
3. <https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2014>
4. https://onlinecourses.nptel.ac.in/noc25_ma21
5. <https://stattrek.com>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26904			Probability And Statistics								3	0	0	3
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	1	1	2	0	0	0	1	0	1	2	3	1	
CO2	3	3	3	2	3	0	0	1	1	2	2	2	3	2	
CO3	3	2	2	1	2	0	0	0	1	1	2	2	3	1	
CO4	3	3	2	2	3	0	0	1	1	1	2	3	3	2	
CO5	3	3	2	2	3	0	0	1	2	2		2	3	2	
Mean Score	3	3	2	2	3	0	0	1	1	1	2	2	3	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26905	Business Mathematics	Multi-Disciplinary Course	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course: Nil			
Course Objectives:							
1. To provide fundamental knowledge of business mathematics concepts such as numbers, percentages, ratios, averages, profit, loss, and discount for solving basic business problems.							
2. To develop understanding of financial mathematics concepts including simple interest, compound interest, present value, future value, and annuities for business applications.							
3. To introduce matrix concepts and their operations, enabling students to apply matrices and determinants in business decision-making problems.							
4. To develop knowledge of statistical measures such as mean, median, mode, range, quartiles, and standard deviation for analyzing business data.							
Course Outcomes:							
CO1: Define the basic concepts of business mathematics, including percentages, ratio, proportion, profit and loss, discount, and interest. (K1)							
CO2: Explain matrix operations and their applications in solving business problems. (K2)							
CO3: Apply measures of central tendency to analyze and interpret statistical data. (K3)							
CO4: Explain the concepts of dispersion and compute appropriate measures for statistical data. (K2)							
CO5: Apply correlation techniques to measure and interpret relationships between business variables. (K3)							
Unit-I	Basic Business Mathematics						9Hrs
Percentages and Its Applications – Ratio and Proportion – Profit and Loss – Discount – Simple interest-Compound Interest-Simple Business Problems.							
Unit-II	Matrix and Business Applications						9Hrs
Introduction to Matrices – Types of Matrices – Addition and Subtraction of Matrices – Multiplication of Matrices – Determinants (2×2 and 3×3) – Inverse of a Matrix – Business Applications of Matrices.							
Unit-III	Measures of Central Tendency						9 Hrs
Meaning and Importance of Statistics – Mean – Median – Mode – Geometric Mean – Harmonic Mean – Simple Statistical Problems.							
Unit-IV	Dispersion						9 Hrs
Range – Quartile Deviation- Standard Deviation – Co efficient of Variation – Simple Statistical Problems.							
Unit-V	Correlation and Business Statistics						9 Hrs
Correlation: Meaning and Types of Correlation – Positive, Negative and Zero Correlation – Karl Pearson's Correlation Coefficient – Rank Correlation (Spearman's Method) – Simple Numerical Problems.							

Text Book(s):

1. Business Mathematics – R.S. Aggarwal, Sultan Chand & Sons, New Delhi.
2. Business Mathematics and Statistics – N.D. Vohra, Tata McGraw Hill Education, New Delhi.
3. Business Mathematics – P.R. Vittal, Margham Publications, Chennai.
4. Matrices - shanti Narayan S. chand& company Ltd., Ram Nagar, New Delhi.

Reference Book(s):

1. Business Mathematics – D.C. Sancheti and V.K. Kapoor, Sultan Chand & Sons, New Delhi.
2. Business Mathematics and Statistics – S.P. Gupta and P.K. Gupta, Sultan Chand & Sons, New Delhi.
3. Mathematics for Management Students – R. S. Bhardwaj, Excel Books, New Delhi.
4. Business Mathematics – S. Chand, S. Chand Publishing, New Delhi.
5. Statistical Methods – S.P. Gupta, Sultan Chand & Sons, New Delhi.

e Resources:

1. <https://nptel.ac.in/courses/110107114>
2. <https://onlinecourses.nptel.ac.in>
3. <https://www.khanacademy.org/math/statistics-probability>
4. <https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2014>
5. <https://learn.saylor.org/course/view.php?id=28>
6. <https://stats.libretexts.org>

Relationship Matrix for COs, POs and PSOs

Semester	Course code			Title of the course								L	T	P	Credit
II	UMA26905			BUSINESS MATHEMATICS								3	0	0	3
Course Outcomes (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	-	-	1	-	-	-	-	2	1	3	1	2	
CO2	3	3	1	-	1	-	-	-	-	2	1	3	2	2	
CO3	3	3	2	2	2	-	-	-	1	2	1	3	3	3	
CO4	3	3	2	2	2	-	-	1	1	3	2	3	3	2	
CO5	2	3	2	2	2	1	1	1	2	3	3	3	3	2	
Mean Overall Score	3	3	1	1	2	0	0	0	0	2	2	2	2	2	

Sem	Course Code	Title of the Course	Course Category	L	T	P	Credits
II	UMA26906	Business Statistics	MDC–Multi Disciplinary Course	3	0	0	3
Pre-Requisite: Nil			Co- Requisite: Nil	Progressive Course:Nil			
Course Objectives: 1.To understand the Business Tools for Decision Making purpose. 2.To understand relationship between correlation and regression. 3.Describe the significance of optimization in identifying optimal solutions for complex business problems. 4.To understand regression and analysis methods. 5.Discuss about budget and methods of calculating budget.							
Course Outcomes:							
CO1: Define the basic concepts of tabulation, classification, diagrams, graphs, and measures of central tendency. (K1)							
CO2: Explain the concepts and measures of dispersion, including range, quartiles, mean deviation, standard deviation, and coefficient of variation. (K2)							
CO3: Apply the methods of skewness and correlation to analyze relationships between statistical data. (K3)							
CO4: Explain regression analysis and time series techniques for analyzing and forecasting data. (K2)							
CO5: Apply index number methods to measure price changes and cost of living using appropriate statistical techniques. (K3)							
Unit-I	INTRODUCTION TO CENTRAL TENDENCY						9 Hrs
Introduction–Tabulation and Classification–Diagrams and Graphs, Measures of Central Tendency–Arithmetic Mean, Median, Mode–Geometric Mean–Harmonic Mean.							
Unit-II	DISPERSION						9 Hrs
Measurement of Dispersion –Range –Quartiles - Deciles – Percentiles – Quartile Deviation –Mean Deviation–Standard Deviation–Co-efficient of Variation.							
Unit-III	SKEWNESS AND CORRELATION						9 Hrs
Measurement of Skewness, Karl Person & Bowley Methods – Correlation – Simple Rank – Co-efficient of Concurrent Deviation.							
Unit-IV	REGRESSION ANALYSIS						9 Hrs.
Regression Analysis –Simple Regression Equations – Time Series Analysis – Components –Fitting a Straight Line by Method of Least Square–Moving Average.							
Unit-V	INDEX NUMBER						9 Hrs

Index Number – Weighted and unweighted – Price index Numbers – types- Tests- Tests in index number Time and factor Reversal Test – Cost of Living index number – Aggregate Method – Family Budget Method.

Text Book(s):

1. Gupta.S.C&Kapoor,V.K,Fundamentals of Mathematical Statistics, Sultan Chand & sons, New Delhi-2002.
2. Business Statistics by P.A.Navanitham, Jai Publications, Trichy.

Reference Book(s):

1. Elements of Practical Statistics by S.K.Kapoor–Oxford and IBHP Publishing Company.
 2. Tools and Decision making by S.L Aggarwal and S.L Bharadwaj, Kalyan Publishers
- Business statistics–Pearson.

e Resources:

1. <https://nptel.ac.in/courses/110107114>
2. <https://nptel.ac.in/courses/110104072>
3. <https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2014>
4. <https://www.khanacademy.org/math/statistics-probability>
5. <https://www.coursera.org/specializations/business-statistics-analysis>

Relationship Matrix for COs, POs and PSOs

Semester	Course code				Title of the course							L	T	P	Credit
II	UMA26906				Business Statistics							3	0	0	3
Course Outcome s (COs)	Programme Outcomes(POs)											Programme Specific Outcomes (PSOs)		Mean Score of COs	
	PO1	PO ₂	PO3	PO4	PO ₅	PO ₆	PO ₇	PO ₈	PO9	PO10	PO11	PSO1	PSO ₂		
CO1	3	2	1	-	2	-	-	-	-	1	1	2	3	2	
CO2	3	3	2	1	2	-	-	-	1	2	1	2	3	2	
CO3	3	3	3	2	2	-	-	-	1	2	1	3	3	2	
CO4	3	3	2	2	3	-	1	1	1	3	2	3	3	2	
CO5	2	3	2	2	3	1	1	2	2	3	3	3	3	2	
Mean Overall Score	3	3	2	1	2	0	0	0	1	2	2	3	3	2	