

SEMESTER – III

CODE	COURSE TITLE
18MSUC305	ANALYTICAL GEOMETRY

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	42	3	--	4

Preamble

- To focus on conceptual and practical understanding
- To discuss the ideas of polar equations
- To illustrate the shapes sphere, cone and cylinder through conceptually and problematically
- To introduce the concepts of quadric cones

Prerequisites

- Students must know the basics of geometry and equations of geometrical figures in both Cartesian and Polar forms

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Develop the polar form of straight lines, circle and conic sections and also to understand their properties	K2
CO2.	Gain more profound knowledge on straight lines	K2
CO3.	Analyze the characteristics of sphere	K4
CO4.	Demonstrate the fundamental concepts of cone and cylinder	K1
CO5.	Integrate the concepts of cone and straight line	K3

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5
CO1.	S	S	S	S	S
CO2.	M	S	S	S	S
CO3.	S	S	S	S	S
CO4.	S	S	M	S	S
CO5.	S	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I**(10 hrs.)**

Polar Equations: Polar co-ordinates–Distance between the points (r_1, θ_1) and (r_2, θ_2) –Transformation of polar co-ordinates into Cartesian co-ordinates and vice-versa–Area of a triangle when the polar co-ordinates of the angular points are known– Equation of a straight line– Parallel straight lines–Perpendicular straight lines–The chord joining the points whose vectorial angles are θ_1 and θ_2 on the circle $r = 2a \cos\theta$ – Polar equation of a conic –Tracing the conic $\frac{l}{r} = 1 + e \cos\theta$ – The equation of the chord of the conic $\frac{l}{r} = 1 + e \cos\theta$ joining the points whose vectorial angles are $\alpha - \beta$ and $\alpha + \beta$ – The asymptotes of the conic $\frac{l}{r} = 1 + e \cos\theta$ – Equation of the normal at a point P whose vectorial angle is α – Some properties of the general conic – The equation of the polar of any point (r_1, θ_1) with respect to the conic $\frac{l}{r} = 1 + e \cos\theta$ –The equation of the pair of tangents drawn from the point (r_1, θ_1) with respect to the conic $\frac{l}{r} = 1 + e \cos\theta$.

UNIT II**(8 hrs.)**

Straight line: A Straight line may be determined as the intersection of two planes –Symmetrical form of the equations of a line –Equations of a straight line passing through two given points – The plane and the straight line– Coplanar lines–Interpretations of equations –Loci–The intersection of three planes – Volume of Tetrahedron.

UNIT III**(9 hrs.)**

Sphere: Definition – Equation of a sphere when the centre and radius are given – The length of the tangent circle on a sphere – The plane section of sphere is a circle – Intersection of two spheres is a circle –The equation of the tangent plane to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at a point (x_1, y_1, z_1) .

UNIT IV**(9 hrs.)**

Cone and Cylinder: The equation of a surface–Cone – Right Circular cone – Intersection of a straight line and a quadratic cone – Tangent plane and normal– Condition for the plane $lx+my+nz=0$ to touch the quadratic cone $ax^2+by^2+cz^2+2fyz+2gzx+2hxy=0$ – The angle between the lines in which the plane $ux+vy+wz=0$ cuts the cone – Cylinder – Enveloping cylinder.

UNIT V**(9 hrs.)**

Central Quadrics: Definition – The intersection of a line and a quadric – Tangents and tangent planes – The condition for the plane $lx+my+nz=0$ to touch the quadratic cone $ax^2+by^2+cz^2=1$ – Polar planes and polar lines – Normal at the point (x_1, y_1, z_1) to the conicoid $ax^2 + by^2 + cz^2 = 1$.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	T.K.Manicavachagom Pillay and T.Natarajan	Analytical Geometry (Part- I – Two Dimensions) (Unit I)	S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai	Reprint 2014
2.	T.K.Manicavachagom Pillay and T.Natarajan	Analytical Geometry (Part- II – Three Dimensions) (Units II,III,IV,V)	S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai	Reprint 2016

Units	Chapter	Sections
I	9	1–15
II	3	1–11
III	4	1 – 8
IV	5	1 – 8.3
V	5	9 – 13

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	P.Duraipandian Kayalal Pachaiyappa	Analytical Geometry 2–D	Muhilan Publishers, Chennai.	Reprint 2010
2	P.Duraipandian Kayalal Pachaiyappa	Analytical Geometry 3–D	Muhilan Publishers, Chennai.	Revised edition 2009

Pedagogy

- Lecture, PPT, Quiz, Group Discussion, Seminar

Web Resources

1. <https://www.khanacademy.org/math/basic-geo/basic-geo-lines/parallel-perp/v/parallel-and->

perpendicular– lines-intro.

2. <http://sigc.edu/department/maths/studymet/AnalyticalGeometry3D>
3. https://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/
4. https://www.whitman.edu/mathematics/calculus/calculus_01_Analytic_Geometry.pdf

- Question paper setters are asked to confine to the above **text books** only.

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
10	5	10	25

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K1, K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K1, K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 8 = 40$	

SEMESTER III

CODE	COURSE TITLE
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18MSUC306	FOUNDATION COURSE IN MATHEMATICS
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Category	CIA	ESE	L	T	P	Credit
CORE	25	75	42	3	-	4

Preamble

- To focus on conceptual understanding
- To strengthen the fundamental knowledge of mathematical concepts
- To introduce the concept of statements and logic, sets and functions, relations and basic principles with due clarity

Prerequisite

- To imbibe the ability in the students to understand, visualize and express mathematics with requisite rigour
- To train the students in problem solving skills

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire the knowledge of Quantifier Statements, Compound statements and some proofs in mathematics	K2
CO2	Apply the concept of basic terminologies, family of sets, power sets and Cartesian product of sets	K3
CO3	Demonstrate the basic definitions of functions, composition of functions and inverse image of subsets under functions	K4
CO4	Analyze the relations on sets and types of relations	K4
CO5	Evaluate the concepts of induction principles, well-ordering principle and equivalence of the three principles	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	M	S	M	S
CO3	S	S	M	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong; M – Medium; L–Low

Syllabus

UNIT I**(8 hrs.)**

Statements and Logic: Statements – Statements with Quantifiers – Compound Statements – Implications – Proofs in mathematics.

Unit II**(8 hrs.)**

Sets: Basic terminologies – Operations on sets – Family of sets – Power sets – Cartesian product of sets.**Unit III**

(10 hrs.)

Functions: Basic definitions – One-one, Onto functions and Bijections – Composition of functions – Inverse of a function – Image of subsets under functions – Inverse image of subsets under functions.

Unit IV**(9 hrs.)**

Relations: Relations on sets – Types of relations – Equivalence relations – Equivalence classes and partitions of a set.

Unit V**(10 hrs.)**

Induction principles: The Induction Principle – The Strong Induction Principle – The Well – Ordering Principle – Equivalence of the three Principles.

Text Book

S. No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Ajit Kumar, S. Kumaresan & Bhaba Kumar Sarma	A Foundation Course in Mathematics	Narosa Publishing House Pvt. Ltd.,	First Reprint 2018

Unit	Chapter	Section
I	1	1.1-1.5
II	2	2.1-2.5
III	3	3.1-3.6
IV	4	4.1-4.4
V	5	5.1-5.4

Referenc Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Ajit Kumar and S. Kumaresan	A Basic Course in Real Analysis	CRC Press	Reprint 2017
2	James Munkres	Topology	Pearson Education (India)	2001, 2 nd Edition
3	Robert G. Bartle and Donald R. Sherbert	Introduction to Real Analysis	Wiley Student Edition	Reprint 2011

Pedagogy

- Lecture, PPT, Quiz, Group Discussion and Seminar

Web resources

1. <http://mtts.org.in/expository-articles>
2. <https://nptel.ac.in/courses/111105098/>
3. <https://www.class-central.com/course/nptel-introductory-course-in-real-analysis-7941>
4. <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/cc-8th-function-intro/v/relations-and-functions>

Question paper setters confine to the above **text book** only.

B.Sc., (Mathematics)

FOUNDATION COURSE IN MATHEMATICS

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
10	5	10	25

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K1, K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K1, K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 8 = 40$	

SEMESTER – IV

CODE	COURSE TITLE
18MSUC407	LINEAR ALGEBRA

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	42	3	--	4

Preamble

- To acquaint students with the fundamental and important topics of linear algebra
- To inculcate and instill the concepts of vector spaces with illustrated examples.
- To emphasize the symbiotic relationship between linear transformations and matrices and
- To impart the concepts of inner product and norms.

Prerequisites

- Students must know the basics of vector algebra and matrices.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concept of vector spaces	K1
CO2	Identify the linear transformation and integrate it with matrices	K2
CO3	Take a look at isomorphism, invertibility and dual spaces	K2
CO4	Apply the ideology of matrices into systems of linear equations	K3
CO5	Get aware of the concepts of inner product spaces	K1

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	M
CO5	S	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

(9 hrs.)

Vector spaces: Vector spaces – Subspaces – Linear Combinations and Systems of Linear Equations – Linear Independence and Linear dependence – Bases and Dimension – Maximal Linearly Independent subsets.

UNIT II

(10 hrs.)

Linear transformations: Linear transformations, Null spaces and Ranges – The matrix representation of a linear transformation – Composition of linear transformation and matrix multiplication.

UNIT III

(8 hrs.)

Isomorphism and Dual Spaces: Invertibility and Isomorphisms – The change of coordinate matrix – Dual spaces.

UNIT IV

(10 hrs.)

Elementary Matrix Operations: Elementary Matrix Operations and Elementary matrices – The rank of a matrix and matrix inverse – Systems of Linear Equations – Theoretical aspects – Systems of Linear Equations – Computational aspects.

UNIT V

(8 hrs.)

Inner product spaces: Inner products and norms – Gram-Schmidt orthogonalization process and Orthogonal complements.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Stephen H.Friedberg, Arnold J. Insel, Lawrence E.Spence	Linear Algebra	Pearson Education India;	2015, 4 th Edition

Units	Chapter	Sections
UNIT I	Chapter I	1.1-1.7
UNIT II	Chapter II	2.1-2.3
UNIT III	Chapter II	2.4-2.6
UNIT IV	Chapter III	3.1-3.4
UNIT V	Chapter VI	6.1-6.2

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kenneth M.Hoffman, Ray Kunze	Linear Algebra	Prentice Hall India Learning Private Limited	2015, 2 nd Edition

Pedagogy

- Lecture, PPT, Quiz, Group Discussion, Seminar

Web Resources

- <http://faculty.atu.edu/mfinan/algebra2.pdf>
- <https://www.math.ucdavis.edu/~linear/linear-guest.pdf>
- <http://joshua.smcvt.edu/linear-algebra/book.pdf>

- Question paper setters are asked to confine to the above **text book** only.

B.Sc., (Mathematics)

LINEAR ALGEBRA

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
10	5	10	25

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K1, K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K1, K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 8 = 40$	

SEMESTER IV

CODE	COURSE TITLE
18MSUC408	REAL ANALYSIS - I

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	42	3	-	4

Preamble

- To study both aspects of analysis, as a qualitative as well as quantitative study of functions
- To study about the order relation, real number system and sequences and their convergence and also to work comfortably with continuity
- To make the students to understand the concept and notion of pure Mathematics in a logical fashion
- To Soak the rudiments of mathematical thinking to the students

Prerequisite

- Knowledge in real numbers, convergence and continuity at basic level

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of partial and total orders, bounds and maximal elements, axiom of choice and its equivalents	K2
CO2	Determine the real number system concept, LUB, Absolute value and Triangle inequality	K3
CO3	Analyze the sequences and their convergence, Cauchy and monotone sequences and sandwich lemma	K4
CO4	Evaluate some important limits and diverging sequence	K4
CO5	Apply the concept of continuity	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	S	S	M	S	M
CO3	M	S	S	M	S
CO4	S	M	M	M	S
CO5	M	S	S	S	M

S – Strong; M – Medium; L–Low

Syllabus

Unit I (10 hrs.)

Order Relation: Partial and Total orders–Chains, Bounds and Maximal elements–Axiom of choice and its equivalents.

Unit II (9 hrs.)

Real Number System: Algebra of the real number system –Upper and lower bounds–LUB property and its applications–Absolute value and Triangle Inequality.

Unit III (8 hrs.)

Sequences and their Convergence: Sequences and their convergence–Cauchy Sequences–Monotone sequences–Sandwich lemma.

Unit IV (9 hrs.)

Sequences and their Convergence: Limits–Sequence Diverging to $\pm\infty$ –Subsequences–Sequences defined recursively.

Unit V (9 hrs.)

Continuity: Continuous Function – $\epsilon - \delta$ Definition of Continuity–Intermediate Value Theorem–Extreme Value Theorem

Text Book:

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Ajit Kumar, S. Kumaresan & Bha ba Kumar Sarma	A Foundation course in Mathematics (UNIT I)	Narosa Publishing House Pvt. Ltd.,	First Reprint 2018
2	Ajit Kumar, S. Kumaresan	Basic Course in Real Analysis (UNIT II to V)	CRC Press, Taylor and Francis Group	Reprint 2017

Unit	Chapter	Section
I	7	7.1-7.3
II	1	1.1-1.4
III	2	2.1-2.4
IV	2	2.5-2.8
V	3	3.1-3.4

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	James Munkres	Topology	Pearson Education (India)	2001, 2 nd Edition
2	Robert G. Bartle and Donald R. Sherbert	Introduction to Real Analysis	Wiley Student Edition	Reprint 2011
3	Tom M. Apostol	Mathematical Analysis	Addition – Wesley Publishing Company	20 th Reprint 2002

Pedagogy

- Lecture, PPT, Quiz, Group Discussion and Seminar

Web resources

1. <http://main.mtts.org.in/expository-articles>
2. <https://nptel.ac.in/courses/111105098/>
3. <https://math.stackexchange.com/questions/593303/online-course-for-real-analysis>
4. https://www.youtube.com/watch?v=_5t1IkCkdW0

Question Paper Setters Confine to the above **text books** only.

B.Sc., (Mathematics)

REAL ANALYSIS - I

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
10	5	10	25

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K1, K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K1, K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 8 = 40$	

SEMESTER – III

CODE	COURSE TITLE
18MSUA3P3	MATHEMATICS FOR PHYSICS– I

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	70	5	--	4

Preamble

- To gain knowledge about different types of series like binomial, exponential and logarithmic series
- To study the fundamental concepts of ordinary differential equations and to solve
- To set forth a platform to solve first and higher order differential equations
- To acquire knowledge of Laplace Transforms
- To prepare students to demonstrate their understanding on applying Laplace transforms to solve ordinary differential equations

Prerequisites

- Students must know the basics of algebra, modeling, differentiation and integration

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Set forth the idea of infinite series and to apply them in real life problems	K2, K3 & K4
CO2	Study the mathematical models of physical problems and solve them	K1
CO3	Learn the concepts of partial differential equations and apply them	K1, K3 & K4
CO4	Introduce the concepts of Laplace transforms	K1 & K3
CO5	Apply Laplace transforms to solve differential equations	K2 & K4

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	S	M
CO3	M	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	M

S-Strong; M-Medium; L-Low

Syllabus

UNIT I (15 hrs.)

Algebra: Binomial, Exponential and *Logarithmic Series* – Approximations obtained by Binomial Theorem – Summation related to Binomial, Exponential and Logarithmic Series.

UNIT II (14 hrs.)

Ordinary Differential Equations (ODEs) : Basic Concepts, Modelling – Geometry Meaning of $y' = f(x, y)$ – Direction fields – Separable ODEs, Modelling – Exact ODEs – *Integrating factors*.

UNIT III (16 hrs.)

Partial Differential Equations: Formation of Partial Differential Equations by eliminating Arbitrary Constants and Arbitrary Functions – Solutions of Standard Types of First Order Equations $f(p, q) = 0$, $f(x, p, q) = 0$, $f(y, p, q) = 0$, $f(z, p, q) = 0$, $f_1(x, p) = f_2(y, q)$; $z = px + qy + f(p, q)$ Lagrange's Method of solving Linear Partial Differential Equation $Pp + Qq = R$ (Problems only).

UNIT IV (15 hrs.)

Laplace Transforms : Laplace Transform – Inverse Transform – Linearity – s -shifting – Transforms of Derivatives and Integrals, ODEs – Unit Step function – t -shifting – Short impulses – *Dirac delta function* - Partial Fractions.

UNIT V (15 hrs.)

Convolution and Solving ODEs : Convolution, Integral equations – Differentiation and Integration of Transforms – Systems of ODEs – *Application Problems*.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	S.Narayanan, R.HanumanthaRao and T.K.ManicavachagomPillay	Ancillary Mathematics,Book – I (Unit I)	S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai	Reprint 2015
2.	Erwin Kreyszig	Advanced Engineering Mathematics (Unit II,IV,V)	John Wiley & Sons Inc.	2011, 9 th Edition
3.	S.NarayananandT.K.Manica vachagomPillay	Calculus Vol.III (Unit III)	S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai	Reprint 2013

Units	Chapter	Sections
I	2 & 3	All sections
II	1	1.1-1.4
III	6	All sections
IV	6	6.1 – 6.4
V	6	6.5 – 6.8

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Tom M.Apostol	Calculus Vol.1 and Vol.2	John Wiley & Sons United States	2016, 2 nd Edition
2.	Dr. B.S.Grewal	Higher Engineering Mathematics	Khanna Publishers	2012 ,42 nd Edition

Pedagogy

- Lecture, PPT, CAS projects, Quiz, Group Discussion, Seminar

Web Resources

1. <https://study.com/academy/lesson/binomial-theorem-applications-examples.html>
2. <https://www.cliffsnotes.com/study-guides/differential-equations/first-order-equations/exact>
3. <https://nptel.ac.in/courses/122104018/node63.html>
4. <http://lipsa.swarthmore.edu/LaplaceXform/FwdLaplace/LaplaceProps.html>
5. https://users.math.msu.edu/users/sen/Math_235/Lectures/lec_14s.pdf
6. <http://hyperphysics.phy-astr.gsu.edu/hbase/Math/Inseries.html>
7. https://www.brainkart.com/article/Partial-Differential-Equations_6484/

8. <http://www.site.uottawa.ca/~remi/ode.pdf>
9. <http://www.sosmath.com/diffeq/first/intfactor/intfactor.html>

- Question paper setters are asked to confine to the above **text books** only.

B.Sc., (Mathematics)

MATHEMATICS FOR PHYSICS– I

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
8	4	8	20

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	20
K1, K2	B	Either / Or	$2 \times 3 = 6$	
K2, K3	C	Open Choice (2 out of 4)	$2 \times 5 = 10$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	55
K1, K2	B	Either / Or	$5 \times 3 = 15$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 6 = 30$	

SEMESTER – III

CODE	COURSE TITLE
18MSUAPP1	LATEX AND SAGEMATH

Category	CIA	ESE	L	T	P	Credit
ALLIED	--	25	--	--	30	1

Preamble

- To give hands-on experience in the Free Open Source Software LaTeX and SageMath which will be useful for teaching and research
- To visualize the mathematical concepts

Prerequisites

- Students must know the basic concepts of calculus, matrices and differential equations

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Use LaTeX to create a document	K1
CO2	Use SageMath as a calculator	K1
CO3	Solve mathematical problems and to plot using SageMath	K2
CO4	Encode LaTeX command in SageMath and to insert SageMath graph in a LaTeXdocument	K3

Mapping with Programme Outcomes

CO _s	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	S	S	M	S	M
CO3	M	S	M	S	M
CO4	M	S	S	S	S
CO5	M	S	M	S	S

S-Strong; M-Medium; L-Low

List of Practicals

1. Creating a LaTeX document with date, title and sections
2. Defining different font sizes and spacing in a LaTeX document.
3. Creating equations using math packages for a given mathematical expression.
4. Creating a table in a LaTeX document.
5. Using SageMath as a calculator and defining own function.
6. Declaring variables and solving single and multivariable problems in SageMath.
7. Plotting functions with advanced techniques in SageMath, including scatter plots.
8. Finding first and higher derivatives of a given function and plotting the together using SageMath.
9. Finding partial derivatives of a given function using SageMath.
10. Solving Ordinary Differential equations
11. Evaluating single and multiple integrals.
12. Defining matrices, performing algebraic operations and finding inverses of the matrices.
13. Finding Laplace transform of given functions using SageMath and to encode it into LaTeX.
14. Inserting a graph from SageMath into a LaTeX document.

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Gregory V.Bard	Sage for undergraduates	American Mathematical Society, Providence, Rhode Island	2015

SEMESTER - III

CODE	COURSE TITLE
18MSUA3C3	MATHEMATICS FOR CHEMISTRY – I

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	70	5	--	4

Preamble

- To focus on conceptual understanding
- To explore fundamental concepts of differential and integral calculus
- To study the basic concepts of matrices and the application of matrix theory

Prerequisites

- Students must know the different types of functions and deriving new functions from given functions
- Students must have the basic knowledge in integration
- Must know the basic formulae of differentiation and problem solving techniques

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of matrices	K1, K2
CO2	solve the system of linear equation using matrix concepts	K2
CO3	Understand the meaning of differentiation using limits	K3
CO4	Evaluate integration of trigonometric functions	K2
CO5	Apply calculus concepts to solve real-world problems such as finding areas and volumes	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	M	S	M	S	S
CO3	S	M	S	M	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

(14 hrs.)

Linear Algebra: Determinants, Matrices: Introduction – Determinants-Properties of determinants-matrices-Matrices operations - Related matrices - Rank of a matrix - Partition method of finding the inverse - Solution of linear system of equations - Consistency of Linear system of Equations.

UNIT II

(16 hrs.)

Linear Algebra: Determinants, Matrices: Linear transformations - Vectors- Eigen values- Properties of eigen values- Cayley – Hamilton theorem- Reduction to Diagonal form – Reduction of Quadratic form to Canonical form – Nature of a Quadratic Form.

UNIT III

(14 hrs.)

Differentiation – Definition – Standard forms – Logarithmic Differentiation – Differentiation of Implicit Functions – Differentiation of one such Function with respect to Another – Successive Differentiation

UNIT IV

(16 hrs.)

Integration of the types $dx/(ax^2+bx+c)$, $lx+m/(ax^2+bx+c)$, $1/\sqrt{ax^2 + bx + c}$, $(px+q)/\sqrt{ax^2 + bx + c}$, $\frac{1}{a \cos x+b}$, $\frac{1}{a \sin x+b}$, $\frac{1}{a^2 \cos^2 x+b^2 \sin^2 x}$ – Integration by parts- Reduction Formulae- Problems – Bernoulli's Formula – Problems.

UNIT V

(15 hrs.)

Multiple Integrals : Evaluation of Double and Triple Integrals (Problems only) – Applications to multiple integrals (Problems only).

Text Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	B.S.Grewal	Higher Engineering Mathematics (Unit I, II)	Khanna Publishers	2012, 42 nd Edition
2	S. Narayanan and T.K.ManicavachagomPillay	Calculus, Vol.I (Unit III)	S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai	Reprint 2015
3	S. Narayanan and T.K.ManicavachagomPillay	Calculus, Vol. II (Units IV, V)	S.Viswanathan Printers and Publishers Pvt. Ltd., Chennai	Reprint 2017

Unit	Chapter	Sections
I	2	2.1-2.10
II	2	2.11-2.18
III	2	1-7
	3	1.1-1.6
IV	1	7.3 (Rule (b) Type (i) & (ii) 8 Case (i) & (ii) 9,12,13,15
V	5	2.1-5.4

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Tom M.Apostol	Calculus Vol.1 and Vol.2	John Wiley & Sons, USA	2016, 2 nd Edition
2	James Stewart	Calculus: Early Transcendentals	Thomson Brooks/Cole, USA	2008 , 2 nd Edition
2	Erwin Kreyszig	Advanced Engineering Mathematics	John Wiley & Sons, USA	2012, 9 th Edition

Pedagogy

- Lecture, PPT, Subject Viva, Seminar, RBPT and Videos

Web Resources

- <https://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video-lectures/>
- <http://www.math.odu.edu/~jhh/Volume-1.PDF>
- <http://www.math.odu.edu/~jhh/Volume-2.PDF>
- <https://www.khanacademy.org/math/algebra-home/alg-system-of-equations/alg-equivalent-systems-of-equations/v/solving-systems-of-equations-by-elimination>
- <https://www.youtube.com/watch?v=SJOTb1FTfs>
- <https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors>

- Question paper setters are asked to confine to the above **text books** only.

II B.Sc., (Chemistry)

MATHEMATICS FOR CHEMISTRY – I

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
8	4	8	20

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	20
K1, K2	B	Either / Or	$2 \times 3 = 6$	
K2, K3	C	Open Choice (2 out of 4)	$2 \times 5 = 10$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	55
K1, K2	B	Either / Or	$5 \times 3 = 15$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 6 = 30$	

SEMESTER – III

CODE	COURSE TITLE
18MSUAPC1	SAGE MATH & OCTAVE

Category	CIA	ESE	L	T	P	Credit
Allied Practical	--	--	--	--	30	1

Preamble

- To give hands-on experience in the Free Open Source Software SageMath and Octave which will be highly useful for future teachers and researchers
- To visualize the mathematical concepts for better understanding
- To inculcate the mathematical concepts through Free Math open software SageMath and Octave

Prerequisites

- Students must know the basic concepts of matrices, differentiation and integration

Course Outcomes

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

COs	CO Statement	Knowledge Level
CO1	Use SageMath as a calculator	K3
CO2	Solve the problems on matrices	K3
CO3	Make use of theoretical concepts to solve problems and visualize the output	K3
CO4	To visualize the geometry through these software	K3

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S

S-Strong; M-Medium; L-Low

List of Practical

1. Use SageMath as a calculator – A financial example
2. Solve quadratic equations
3. Define 3×3 matrix and find the transpose of a given matrix
4. Find the matrix multiplication for $n \times n$, $n=1,2,3$
5. Evaluate the determinant and find the inverse of a given matrix
6. Find the eigenvalues and eigenvectors of a given matrix
7. Solve the linear system of equations with single variable
8. Solve the system of equations using 3 variables
9. Find the root of a polynomial
10. Find the surface area using double integral
11. Find the volume using triple integral
12. Use Sage to calculate definite integral and plot
13. Use Sage to calculate indefinite integral
14. Apply Sage to balance the chemical reaction using matrices
15. Find the area of circle
16. Use Sage to find derivatives & plot $f(x)$ and $f'(x)$ Together and find Higher-Order Derivatives

Text Book

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Gregory V. Bard	Sage for Undergraduates	American Mathematical Society, Providence, Rhode Island	2015

SEMESTER - III

CODE	COURSE TITLE
18MAUA303	MATHEMATICS FOR COMMERCE

Category	CIA	ESE	L	T	P	Credit
Allied	25	75	80	10	-	5

Preamble

- To develop the basic knowledge and skills in mathematics to deal with business problems

Prerequisite

- Must know about all types of number systems, their properties and about logarithms and basic algebraic operations with numbers

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Learn about HCF, LCM, Progressions and about Ratios and Proportion.	K1, K2
CO2	Study the concept of matrices and applying it to solve simultaneous linear equations	K2
CO3	Acquire knowledge about mathematics of finance	K3
CO4	Know the concept of differentiation and its application to business problems.	K2, K3
CO5	Learn the concept of integration and its application in business economics.	K2

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	L	S	M
CO2	S	S	L	S	S
CO3	S	S	M	S	S
CO4	S	S	M	M	S
CO5	M	S	M	M	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I (18 hrs.)

Number System : Introduction – Natural Number System – Highest Common Factor – Least Common Multiple – Progression – Arithmetic Progression–Arithmetic mean–Geometric Progression – Geometric Mean – Ratios – Proportion – Mixtures.

Unit II (17 hrs.)

Matrices :Introduction – Types of matrices – Algebra of matrices – Transpose of a matrix – Determinants – Inverse of a matrix – Solution of simultaneous equations –Rank of a matrix.

Unit III (18 hrs.)

Mathematics of Finance : Simple Interest – Compound Interest – Effective and Nominal Rate of Interest – Depreciation – Annuities

Unit IV (18 hrs.)

Discounting of Bills : Sinking fund – Amortization table –Discounting – Banker's Discount– True Discount – Banker's Gain – Cash Value – Actual Rate of Interest – Equated Due Date.

Unit V (19 hrs.)

Applications of Differentiation :Introduction to Differentiation – Elasticity – Elasticity of Demand – Elasticity of Supply – Marginal Cost and Marginal Revenue – Relation between Marginal Revenue & Elasticity of Demand – Maxima and Minima.

Applications of Integration: Introduction to Integration – Calculation of Cost function –Calculation of Revenue function.

Case Studies:

- Calculate Secondary overhead distribution summary using Simultaneous Equations method
- Preparation of Bank statement
- Applications of matrix in Business Problems
- Develop an Amortization table for Loan amount – EMI calculation
- Obtain the revenue function for x units of sales & find the marginal revenue

Text Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	M.Wilson	Business Mathematics(Units I, II and V)	Himalaya Publishing House, Mumbai	Reprint 2016
2	P.A. Navnitham	Business Mathematics & Statistics (Units III and IV)	Jai Publishers, Trichy	Reprint2017

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	B.C.Mehta and G.M.K. Madnani	Mathematics for Economists	Sultan Chand & Sons, New Delhi	Reprint 2004

Pedagogy

- Lecture, PPT, Subject Viva, Seminar, Case Studies and Videos

Web Resources

1. https://www.youtube.com/watch?v=Bdrwcjg8W_w&t=36s
2. <https://www.youtube.com/watch?v=rS9AwyRbB7g>
3. <https://www.youtube.com/watch?v=NvVKOO1pY5g&t=37s>
4. <https://www.youtube.com/watch?v=7Nz06RhcA8Y&t=64s>
5. <https://www.youtube.com/watch?v=gEpYrtKCgt8>

Question paper setters are asked to confine to the above **text books** only

II B.Com

MATHEMATICS FOR COMMERCE

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
10	5	10	25

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K1, K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K1, K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 8 = 40$	

SEMESTER – IV

CODE	COURSE TITLE
18MSUA4P4	MATHEMATICS FOR PHYSICS – II

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	70	5	--	4

Preamble

- To introduce multiple integrals and learn their applications
- To put forth the concepts of application of multiple integrals and to evaluate improper integrals
- To acquire the knowledge of Fourier series to various wave forms
- To assimilate the concepts of Fourier integrals

Prerequisites

Students must know the basic mathematical concepts at higher secondary level.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Introduce the concepts of vectors and to apply in physical problems	K1 & K3
CO2	Evaluate multiple integrals in both Cartesian and polar coordinates	K1
CO3	Apply multiple integrals to find area under a given curve and to evaluate improper integrals	K1 ,K3 & K4
CO4	Find the Fourier series to various functions	K2
CO5	Learn the Fourier integrals for odd and even functions	K1

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	M	S	S	S	S
CO3	S	S	S	S	M
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

(15 hrs.)

Vector Calculus :Vectors in 2-Space and 3-Space – Inner Product – Vector product – Vector and Scalar Functions and Fields – *Derivatives* – Curvature - Torsion - Gradient of a Scalar Field – Directional Derivative – Divergence of a Vector Field – Curl of a Vector Field – *Simple Problems.*

UNIT II

(16 hrs.)

Integration: Multiple Integrals – Evaluation of Double Integrals (Excluding Changing the Order of Integration) – Double Integrals in Polar coordinates – *Evaluation of Triple Integrals*

UNIT III

(14 hrs.)

Application of Integration:*Application of Double integral in Evaluating Area Between Curves*– Jacobian of Two and Three Variables – Beta and Gamma Functions – Relation –Evaluation of Double and Triple Integrals using Beta and Gamma Functions.

UNIT IV

(16 hrs.)

Fourier Series :Fourier Series – Functions of any Period $p=2L$ – Even and Odd Functions, *Half – Range Expansions.*

Fourier Integral :Fourier Integral – Fourier Cosine and Sine Transforms – *Simple Problems.*

UNIT V

(14 hrs.)

Numerical Integration :Introduction – General Quadrature Formula for Equidistant Ordinates – Trapezoidal Rule – Simpson's One-Third Rule – *Simpson's Three – Eighth's rule*

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Erwin Kreyszig	Advanced Engineering Mathematics (Units I,III,V)	John Wiley & Sons Inc.	2011,9 th Edition
2.	S.Narayanan&T.K.M.Pillay	Calculus Vol.II (Units I,II)	Viswanathan, S., Printers & Publishers Pvt. Ltd., Chennai	Reprint 2012
3.	G.ShankerRao	Numerical Analysis (Unit IV)	New Age International Publishers,New Delhi	2018,5 th edition

Units	Chapters	Sections
I	9	9.1 – 9.5 & 9.7 – 9.9
	5	2.1,2.2,3.1,3.2,4
II	5,6 and 7	5.1-5.4,1.1&1.2 and2.1- 2.3,3,4,5,6
III	11	11.1 – 11.3 & 11.7 – 11.8
IV	9	9.1 – 9.5
V	9	9.1 – 9.5 & 9.7 – 9.9

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	B.S.Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi	2014, 43 rd Edition
2.	K.F.Riley, M.P.Hobson&S.J.Bence	Mathematical Methods for Physics and Engineering	Cambridge University Press	2018 ,3 rd Edition

Pedagogy

- Lecture, PPT, Quiz, Group Discussion, Seminar

Web Resources

- <https://betterexplained.com/articles/category/math/vector-calculus/>
- https://www.whitman.edu/mathematics/calculus_online/chapter15.html
- <https://courses.lumenlearning.com/boundless-calculus/chapter/multiple-integrals/>
- <https://study.com/academy/lesson/gamma-function-properties-examples.html>
- <http://w.astro.berkeley.edu/~jrg/ngst/fft/comms.html>
- https://www.youtube.com/watch?v=tp_MdKz3fC8
- <https://www.youtube.com/watch?v=DYsv6L-VcsQ>
- <http://www.damtp.cam.ac.uk/lab/people/sd/lectures/nummeth98/integration.htm>
- https://en.wikibooks.org/wiki/Numerical_Methods/Numerical_Integration
- Question paper setters are asked to confine to the above **text books** only.

B.Sc., (Mathematics)

MATHEMATICS FOR PHYSICS– II

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
8	4	8	20

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	20
K1, K2	B	Either / Or	$2 \times 3 = 6$	
K2, K3	C	Open Choice (2 out of 4)	$2 \times 5 = 10$	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	55
K1, K2	B	Either / Or	$5 \times 3 = 15$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 6 = 30$	

SEMESTER – IV

CODE	COURSE TITLE
18MSUAPP2	OCTAVE

Category	CIA	ESE	L	T	P	Credit
ALLIED	--	25	--	--	30	1

Preamble

- To give hands-on experience in the Free Open Source Software Octave which is an excellent tool for teaching and research
- To visualize the mathematical concepts in 2D and 3D

Prerequisites

- Students must know the basic concepts of calculus, matrices, differential equations, statistical tools and number theory.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Use Octave as a calculator	K1
CO2	Plot graphs to improve presentations	K2
CO3	Visualize the mathematical concepts through 3D plots	K2
CO4	Learn looping concept to various mathematical problems	K3

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	S	S	M	S	M
CO3	M	S	M	S	M
CO4	M	S	S	S	S
CO5	M	S	M	S	S

S–Strong; M–Medium; L–Low

List of Practicals

1. Using octave as a calculator and learning built-in functions.
2. Defining vectors and matrices and performing basic algebraic operations.
3. Plotting 2D graphs and editing.
4. Plotting 3D graphs for any given functions.
5. Solving simultaneous linear equations.
6. Finding mean, median, mode, range, standard deviation and variance of a given data.
7. Defining sets and performing various set operations.
- 8 Solving differential equations of first and second order.
- 9 Finding arithmetic Progression and Geometric Progression.
- 10 Finding sum of n natural numbers and sum of square of n natural numbers

SEMESTER – IV

CODE	COURSE TITLE
18MSUA4C4	MATHEMATIS FOR CHEMISTRY – II

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	70	5	-	4

Preamble

- To acquire complete knowledge of summation and approximation through Binomial, Exponential and Logarithmic series
- To understand concepts and improve problem solving skills on theory of equations
- To provide basic knowledge about statistics and its applications and interpreting the results obtained

Prerequisite

- Knowledge in basic concepts of series, equations and types of equations
- Must have a knowledge about collection of data, classification and tabulation

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Find the sum of finite and infinite Binomial, Exponential and Logarithmic series	K1
CO2	Solve equations using various techniques	K2
CO3	To learn about various measures of central tendencies and their appropriate usage	K3
CO4	To study the measures of dispersion	K3
CO5	To understand the relationship between the variables under consideration	K2

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	M	M	S	S
CO5	M	M	M	S	S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

(13 hrs.)

Binomial, Exponential and Logarithmic Series: Theorems – Statements without proofs – Emphasize on their Immediate application to Summation and Approximation. (Problems only)

UNIT II

(16 hrs.)

Theory of Equations: Roots of an Equation – Relations Connecting the Roots and Coefficients — Transformations of Equations — Descarte’s Rule of Signs, Horner’s Method upto Two Decimal Places

UNIT III

(16 hrs.)

Diagrams and Measures of Central tendency : Diagrammatic Presentation – Bar and Pie Diagrams – Graphic presentation –Graph of Frequency Distribution.Measures of Central Tendency – Averages – Simple and Weighted – Mean, Median, Mode, Geometric Mean and Harmonic Mean – Their– Computation Properties and Uses (Problems only)

UNIT IV

(14 hrs.)

Measures of Dispersion : Range, Coefficient of Range, Quartile Deviation, Coefficient of Quartile Deviation – Mean Deviation, Coefficient of Mean Deviation, Standard Deviation and Coefficient of Variation. (Problems only)

UNIT V

(16 hrs.)

Correlation and Regression: Correlation – Meaning and Definition – Scatter Diagram – Pearson’s Coefficient of Correlation – Rank Correlation – Computation and interpretation – Regression – Properties of Regression Coefficient – Meaning of Regression – Regression Equations – Mathematical properties of Regression coefficient – Uses of Regression (Problems only)

Case Studies

- Effect of Hardness of water
- Total dissolved solids
- Chloride content in water sample
- Waste disposal in your locality
- How to identify the pesticides present in fruits, vegetables and beverages
- Effect of ammonia in cosmetics (For e.g. Hair dye, Shampoo, etc.,)
- Effect of pH in toilet soap and bath soap

Text Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	T. Natarajan, T.K. ManicavachagomPilla y&K.S.Ganapathy	Algebra –Vol. I (Units I, II)	S.Viswanathan Printers and Publishers Pvt., Ltd., Chennai.	Reprint 2015
2	R.S.N Pillai, Bagavathi	Statistics: Theory and Practice (Unit III to V)	Sultan Chand & Co., New Delhi	Reprint 2015

Unit	Chapter	Sections
I	3	1,5 – 6,10
	4	1,2,3,5,6
II	6	1-11,15-15.3,24,30
III	7,9	All Sections
IV	10	All Sections
V	12,13	All Sections

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	R.M. Khan	Algebra - Classical, Modern, Linear & Boolean	New central Book Agency(P) Ltd., Kolkata	Reprint 2016
2	H.S. Hall &S.R.Knight	Higher Algebra	AITBS Publishers, India	Reprint 2014
3	Erwin Kreyszig	Advanced Engineering Mathematics	John Wiley & Sons, USA	2012, 9 th Edition
4	PA. Navnitham	Business Mathematics & Statistics	Jai Publishers, Trichy	Reprint 2017
5	P.R.Vittal	Business Mathematics & Statistics,	Margham Publications, Chennai	Reprint 2002

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar and Subject Viva

Web Resources

- <http://nptel.ac.in/courses/106105162/18>
- <http://nptel.ac.in/courses/111106083/33>
- <https://www.khanacademy.org/math/algebra2/polynomial-functions/fundamental-theorem-of-algebra/v/possible-real-roots>
- <http://www.math.kent.edu/~white/FCA/text/jan09ed.pdf>
- http://www.gutenberg.org/files/29785/29785-pdf.pdf?session_id=1888afffae379b4647cad5675a6b169d2543f267

- Question paper setters are asked to confine to the above **text books** only

II B.Sc., (Chemistry)

MATHEMATICS FOR CHEMISTRY – II

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
8	4	8	20

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	2 x 2 = 4	20
K1, K2	B	Either / Or	2 x 3 = 6	
K2, K3	C	Open Choice (2 out of 4)	2 x 5 = 10	

Model and End Semester Examinations

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	5 x 2 = 10	55
K1, K2	B	Either / Or	5 x 3 = 15	
K2, K3, K4	C	Open Choice (5 out of 8)	5 x 6 = 30	

SEMESTER IV

CODE	COURSE TITLE
18MSUAPC2	R SOFTWARE

Category	CIA	ESE	L	T	P	Credit
Allied Practical	--	25	--	--	15	1

Preamble

- To apply the statistical knowledge acquired through the theory course

Prerequisite

- To be familiar with the basic statistical concepts of measures of central tendency, measures of dispersion, descriptive statistics, correlation, regression and basic computer knowledge.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Be equipped with the professional competency through learning Free Open Source Software – R	K3
CO2	Create the database, visualizing and analyzing the data using R	K2
CO3	Make inferences through the results obtained	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	S	S
CO3	S	S	M	S	S

S-Strong; M-Medium; L-Low

List of practicals

1. Using R software as a calculator
2. Data entry, manipulation and retrieval (Notepad, Excel sheet)
3. Data frame, creating matrices and operations with matrices
4. To calculate mean, median, Standard deviation, Variance
5. To determine a confidence interval for the populations' mean
6. To calculate the correlation between amount of fertilizers and yield of crops
7. To create a histogram for the mean in an interval of 30 days and interpret result with normal probability plot
8. To create different types of bar chart of the daily nutritional requirements
9. To create a piechart of pH values in different kinds of bath soap and in different kinds of detergent cake
10. To create a box plot of amount of citric acid content in various soft drinks
11. Fitting of linear regression line and plot
12. To find multiple linear regression and partial correlation between the pH level of soil, amount of fertilizer used and yield of crops

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	Sarah Stowell	Using R for Statistics	Apress, USA	2014, 1 st Edition
2	Getting Started with R	Paul Teter	O'Reilly Media, Inc., Sebastopol, CA	Reprint April 2016
3	Kim Seefeld and Ernst Linder	Statistics Using R with Biological Examples	https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf	online

SEMESTER IV

CODE	COURSE TITLE
18MAUA404	STATISTICS FOR COMMERCE

CATEGORY	CIA	ESE	L	T	P	Credit
ALLIED	25	55	56	4	-	4

Preamble

- To provide basic knowledge about statistics and its applications and interpreting the results obtained.

Prerequisite

- Must possess knowledge about collection of data, classification and tabulation.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Learn about various measures of central tendencies and their appropriate usage.	K2, K3
CO2	Study the measures of dispersion.	K3
CO3	Understand the relationship between the variables under consideration.	K3
CO4	Find the missing values in the given data using interpolation.	K3
CO5	Know the concepts of index numbers and time series analysis	K2

Mapping with Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	M	M	S	S
CO5	M	M	M	S	S

S

S-Strong; M-Medium; L-Low

Syllabus

UNIT I

(11 hrs.)

Diagrams and Measures of Central Tendency : Diagrammatic Presentation – Bar and Pie Diagrams – Graphic presentation – Graph of Frequency Distribution. Measures of Central Tendency – Averages – Simple and Weighted – Mean, Median, Mode, Geometric Mean and Harmonic Mean – Their Computation – Properties and Uses.

UNIT II

(13 hrs.)

Measures of Dispersion : Range, Coefficient of Range, Quartile Deviation, Coefficient of Quartile Deviation – Mean Deviation, Coefficient of Mean Deviation, Standard Deviation and Coefficient of Variation.

UNIT III

(12 hrs.)

Correlation and Regression: Correlation – Meaning and Definition – Scatter Diagram – Pearson's Coefficient of Correlation – Rank Correlation – Computation and interpretation – Regression – Properties of Regression Coefficient – Meaning of Regression – Regression Equations – Mathematical properties of Regression coefficient – Uses of Regression.

UNIT IV

(12 hrs.)

Index Numbers and Interpolation : Index Numbers – Meaning – Uses – Methods of Construction – Aggregative and Relative Types – Tests of consistency of index Number – Consumer price index Number – Methods of Construction – Interpolation – Binomial method – Method of advancing differences – Newton's method of backward differences – Lagrange Method .

UNIT V

(12 hrs.)

Analysis of Time Series: Meaning – Time series Components – Models – Measurement of Secular Trend – Measurement of Seasonal Variation.

Case Studies:

- Collect marks scored by 150 students in an examination and make a frequency distribution table, subject wise and class wise.
- Collect data relating to prices of shares of two companies for ten days and ascertain stability of share prices.
- Select 10 items of daily consumed products and collect base year quantity, base year price and current year price in your street/place. Calculate Cost of Living Index.
- Fit a straight line trend for the production of a company for 10 years & forecast the future trend.
- Collect the sales & profit of 10 items in a shop and find the correlation between sales and profit.

Text Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	R.S.N Pillai, Bagavathi	Statistics Theory and Practice	Sultan Chand & Co., New Delhi	Reprint 2015

Reference Books

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	PA. Navnitham,	Business Mathematics & Statistics	Jai Publishers, Trichy	Reprint 2017
2	P.R.Vittal	Business Mathematics & Statistics	Jai Publishers, Trichy,	Reprint 2004

Pedagogy

- Lecture, PPT, Subject Viva, Seminar, Case Studies and Videos

Web Resources

1. <https://www.youtube.com/watch?v=JPKOLFsu18g>
2. https://www.youtube.com/watch?v=_ntEriqkhEA
3. <https://www.youtube.com/watch?v=xTpHD5WLuoA&t=135s>
4. https://www.youtube.com/watch?v=jd_KUEUt4Dg
5. https://www.youtube.com/watch?v=d4Sn6ny_5LI

- Question paper setters are asked to confine to the above **text book** only.

II B. Com
STATISTICS FOR COMMERCE

Bloom's Taxonomy Based Assessment Pattern

Components of CIA marks

Test (I & II)	Assignment / Seminar / Subject viva	Model Examination	Total
8	4	8	20

Continuous Internal Assessment I & II

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	20
K1, K2	B	Either / Or	$2 \times 3 = 6$	
K2, K3	C	Open Choice (2 out of 4)	$2 \times 5 = 10$	

Model and End Semester Examination

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	55
K1, K2	B	Either / Or	$5 \times 3 = 15$	
K2, K3, K4	C	Open Choice (5 out of 8)	$5 \times 6 = 30$	

SEMESTER IV

CODE	COURSE TITLE
18MAUAP01	STATISTICAL SOFTWARE R

Category	CIA	ESE	L	T	P	Credit
Allied Practical	--	25	--	--	15	1

Preamble

- To apply the statistical knowledge acquired through the theory course

Prerequisite

- To be familiar with the basic statistical concepts of measures of central tendency, measures of dispersion, descriptive statistics, correlation, regression and basic computer knowledge.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Be equipped with the professional competency through learning Free Open Source Software – R	K3
CO2	Create the database, visualizing and analyzing the data using R	K2
CO3	Make inferences through the results obtained	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	S	S
CO3	S	S	M	S	S

S-Strong; M-Medium; L-Low

List of practicals

1. Using R software as a calculator.
2. Data entry, manipulation and retrieval (Notepad, Excel sheet).
- 3 Data frame, creating matrices and operations with matrices.
4. Descriptive statistics, Graphics - pie diagram, box plot, histogram, bar plot.
5. Object orientation, defining functions.
6. Find mean, median, geometric mean, harmonic mean of numerical data and edit the output.
7. Determine standard deviation, variance and checking the consistency of the given data and edit the output.
8. Find the range and skewness for the given data.
9. Bivariate data- scatter plot, correlation co-efficient, fitting linear regression line.
10. Multiple linear regression models.
11. Analysis of Variance (ANOVA).

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1	W. John Braun and Duncan J. Murdoch	A First Course in Statistical Programming with R	Cambridge University Press, New York	2007, 2 nd edition
2	J H Maindonald	Using R for Data Analysis and Graphics: Introduction, Code and Commentary	https://cran.r-project.org/doc/contrib/usingR.pdf	2008, 3 rd edition
3	Kim Seefeld and Ernst Linder	Statistics Using R with Biological Examples	https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf	online