CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

(Nationally Re-accredited (III cycle) with 'A' (CGPA 3.41 out of 4)

Grade by NAAC

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

B.Sc MATHEMATICS SYLLABUS

2021-2022 ONWARDS

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG AND RESEARCH DEPARTMENT OF MATHEMATICS
B.Sc MATHEMATICS
PROGRAMME OUTCOMES

PO1	Demonstrate basic manipulative skills in algebra, geometry and trigonometry.
PO2	Communicate mathematical principles and ideas with clarity and coherence, both written and verbally, demonstrating communication skills to be used in any future career.
PO3	Demonstrate proficiency in linear algebra, real and complex analysis as well as areas of modern, proof-based Mathematics.
PO4	Compute limits and derivatives using their definitions, and use the fundamental theorem of calculus to compute definite and indefinite integrals.
PO5	Construct counter examples to mathematical statements and understand the importance of hypotheses into a viable career path.

CAUVERY COLLEGE FOR WOMEN(AUTONOMOUS)
PG AND RESEARCH DEPARTMENT OF MATHEMATICS
B.Sc MATHEMATICS COURSE STRUCTURE
(For the candidates admitted in the year 2021-2022)

Sem	Part	Course	Course Title	Course Code	Ins. Hrs	Credit	Exam Hours	Marks Int	Marks Ext	Total
I	I	Language Course – I (LC) – Tamil*/Other Languages +#	இக்கால இலக்கியம்	19ULT1/ 19ULH1/ 19ULS1/ 19ULF1	6	3	3	25	75	100
			Story, Novel, History of Hindi Literature-I &Grammar – 1							
			History of Popular Tales Literature and Sanskrit Story							
			Communication in French –I							
	II	English Language Course - I (ELC)	Functional Grammar for Effective Communication –I	19UE1	6	3	3	25	75	100
	III	Core Course – I (CC)	Differential Calculus and Trigonometry	19UMA1CC1	5	5	3	25	75	100
		Core Course – II (CC)	Integral Calculus and Fourier Series	19UMA1CC2	6	6	3	25	75	100
		First Allied Course – I (AC)	Mathematical Statistics – I	19UMA1AC1	5	3	3	25	75	100
	IV	UGC Jeevan Kaushal Life skills	Universal Human Values	20UGVE	2	2	3	25	75	100
				TOTAL	**30**	**22**	**-**	**-**	**-**	**600**

Sem	Part	Course	Course Title	Course Code	Ins. Hrs	Credit	Exam Hours	Marks Int	Marks Ext	Total
II	I	Language Course – II (LC) - Tamil*/Other Languages +#	இடைக்கால இலக்கியமும், புதினமும் Prose, Drama, History of Hindi Literature –II & Grammar - 2 Poetry, Textual Grammar and Alakara Communication in French –II	19ULT2/ 19ULH2/ 19ULS2/ 19ULF2	6	3	3	25	75	100
	II	English Language Course – II(ELC)	Functional Grammar for Effective Communication –II	19UE2	6	3	3	25	75	100
	III	Core Course – III (CC)	Analytical Geometry and Vector Calculus	20UMA2CC3	6	6	3	25	75	100
		First Allied Course – II (AP)	Mathematical Statistics- II (Practical)	19UMA2AC1P	5	3	3	40	60	100
		First Allied Course – III (AC)	Mathematical Statistics-III	19UMA2AC2	5	3	3	25	75	100
	IV	Environmental Studies	Environmental Studies	21UGES	2	2	3	25	75	100
	V	**Extra Credit Course**	**Swayam Online Course**	**To be fixed Later**	**As Per UGC Recommendations**					
				TOTAL	**30**	**20**	**-**	**-**	**-**	**600**

Sem	Part	Course	Course Title	Course Code	Ins. Hrs	Credit	Exam Hours	Marks Int	Marks Ext	Total
III	I	Language Course – III (LC) – Tamil*/Other Languages +#	காப்பியமும், நாடகமும் / Medieval, Modern Poem, Poetics & History of Hindi Literature – 3 / Prose, Textual Grammar and Vakyarachana / Communication in French –III	19ULT3/ 19ULH3/ 19ULS3/ 19ULF3	6	3	3	25	75	100
	II	English Language Course - III(ELC)	Reading and Writing For Effective Communication- I	19UE3	6	3	3	25	75	100
	III	Core Course – IV CC)	Differential Equations and Laplace Transforms	19UMA3CC4	5	5	3	25	75	100
		Core Course – V (CC)	Classical Algebra and Theory of Equations	19UMA3CC5	5	5	3	25	75	100
		Second Allied Course – I (AC)	Python Programming	21UMA3AC3	4	4	3	25	75	100
		Second Allied Course – II (AP)	Python Programming LAB	21UMA3AC2P	2	2	3	40	60	100
	IV	Non Major Elective I – for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil up to 10th, +2 but opt for other languages in degree programme	Mathematics for competitive Examinations-I	19UMA3NME1	2	2	3	25	75	100
			Basic Tamil	19ULC3BT1						
			Special Tamil	19ULC3ST1						
	V	**Extra Credit Course**	**Swayam Online Course**	**To be fixed Later**	**As Per UGC Recommendations**					
			TOTAL		30	24	-	-	-	700

Sem	Part	Course	Course Title	Course Code	Ins. Hrs	Credit	Exam Hours	Int	Ext	Total
IV	I	Language Course – IV(LC) - Tamil*/Other Languages +#	பண்டைய இலக்கியம் Letter Writing, Precise Writing, General Essays, Technical Terms, Proverbs, Amplifications, Idioms & Phrases, History of Hindi Literature – 4 Drama, History of Drama Literature Communication in French –IV	19ULT4/ 19ULH4/ 19ULS4/ 19ULF4	6	3	3	25	75	100
	II	English Language Course – IV(ELC)	Reading and Writing For Effective Communication- II	19UE4	6	3	3	25	75	100
	III	Core Course – VI (CC)	Sequences and Series	21UMA4CC6	6	5	3	25	75	100
		Core Course – VII (CC)	Methods in Numerical Analysis	21UMA4CC7	4	3	3	25	75	100
		Second Allied Course – III (AC)	Internet of Things	21UMA4AC4	4	3	3	25	75	100
	IV	Skill Based Elective-I (SBE)	Introduction to R	21UMA4SBE1A	2	2	3	25	75	100
			Introduction to Statistical Tools and Techniques – SPSS	21UMA4SBE1B						
		Non Major Elective II – for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil up to10th, +2 but opt for other languages in degree programme	Mathematics for competitive Examinations-II	19UMA4NME2	2	2	3	25	75	100
			Basic Tamil	19ULC4BT2						
			Special Tamil	19ULC4ST2						
	V	**Extra Credit Course**	**Swayam Online Course**	**To be fixed Later**	**As Per UGC Recommendations**					
			TOTAL		30	21	-	-	-	700

Sem	Part	Course	Course Title	Course Code	Ins. Hrs	Credit	Exam Hours	Marks Int	Marks Ext.	Total
V	III	Core Course – VIII (CC)	Abstract Algebra	21UMA5CC8	6	5	3	25	75	100
		Core Course – IX (CC)	Real Analysis	21UMA5CC9	5	5	3	25	75	100
		Core Course – X (CC)	Statics	21UMA5CC10	5	4	3	25	75	100
		Core Course – XI (CC)	Discrete Mathematics	21UMA5CC11	4	3	3	25	75	100
		Major Based Elective- I	Fuzzy Set Theory and its Applications	21UMA5MBE1A	4	3	3	25	75	100
			Astronomy	21UMA5MBE1B						
			Artificial Intelligence	21UMA5MBE1C						
	IV	Skill Based Elective-II	Statistical Tools and Techniques – R Programming (Practical)	19UMA5SBE2AP	2	2	3	40	60	100
			Statistical Tools and Techniques – SPSS (Practical)	19UMA5SBE2BP						
		Skill Based Elective -III	LaTeX (Practical)	21UMA5SBE3AP	2	2	3	40	60	100
			Numerical methods with MATLAB Programming (Practical)	21UMA5SBE3BP						
		UGC Jeevan Kaushal Life Skills	**Professional Skills**	**19UGPS**	**2**	**2**	**3**	**25**	**75**	**100**
	V	**Extra credit course**	**Swayam Online Course**	**To be fixed Later**	**As per UGC Recommendations**					
		TOTAL			**30**	**26**	**-**	**-**	**-**	**800**

15 Days INTERNSHIP during Semester Holidays

Sem	Part	Course	Course Title	Course Code	Ins. Hrs	Credit	Exam Hours	Marks Int	Marks Ext.	Total
VI	III	Core Course – XII (CC)	Linear Algebra	21UMA6CC12	5	5	3	25	75	100
		Core Course – XIII (CC)	Complex Analysis	21UMA6CC13	6	5	3	25	75	100
		Core Course – XIV (CC)	Dynamics	21UMA6CC14	5	5	3	25	75	100
		Core Course – XV (CC)	Operations Research	21UMA6CC15	5	4	3	25	75	100
		Major Based Elective-II	Graph Theory	21UMA6MBE2A	4	3	3	25	75	100
			Mathematical Modelling	21UMA6MBE2B						
			Fundamentals of Big Data Analytics	21UMA6MBE2C						
		Major Based Elective-III	Probability and Queueing Theory	21UMA6MBE3A	4	3	3	25	75	100
			Number Theory	21UMA6MBE3B						
			Web Technology	21UMA6MBE3C						
	V	Gender Studies	Gender Studies	19UGGS	1	1	3	25	75	100
		Extension Activities	Extension Activities	19UGEA	-	1	-	-	-	-
		Extra credit course	**ECC-Internship**	21UMA6INT	-	2	-	-	100	100
		TOTAL			30	27	-	-	-	700
		GRAND TOTAL			180	140	-	-	-	4100

List of Allied Courses

Group I (Any one)   **Group II (Any one)**
1. Physics   1. Chemistry
2. Mathematical Statistics   2. Computer Science
3. Financial Accounting   3. Management Accounting

Language Part – I	-	4
English Part –II	-	4
Core Paper	-	15
Allied Paper	-	4
Allied Practical	-	2
Non-Major Elective	-	2
Skill Based Elective	-	3
Major Based Elective	-	3
Environmental Studies	-	1
Universal Human Values	-	1
Professional Skills	-	1
Gender Studies	-	1
Extension Activities	-	1	(Credit only)
Internship	-	1	Extra credit -2

➤For those who studied Tamil up to 10th, +2 (Regular Stream)

 + Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil up to 10th,+2 but opt for other languages in degree level under Part I
   should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours
Non Major Elective I & II – for those who studied Tamil under Part I
   a) Basic Tamil I & II for other language students
   b) Special Tamil I & II for those who studied Tamil up to 10th or +2 but opt for other languages in degree programme
   Note:

	Internal Marks	**External Marks**
1. Theory	25	75
2. Practical	40	60
3. Internship	-	100

3. Separate passing minimum is prescribed for Internal and External marks

FOR THEORY
The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]
The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL
The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

SEMESTER I

DIFFERENTIAL CALCULUS AND TRIGONOMETRY

2019-2020 Onwards

Semester – I		Hours/Week – 5	
CORE COURSE-I	**DIFFERENTIAL CALCULUS AND TRIGONOMETRY**	**Credits – 5**	
Course Code – 19UMA1CC1		**Internal** 25	**External** 75

Objectives:

➢ To inculcate the basics of differentiation and their applications.
➢ To introduce the notion of curvature, Evolutes and Involutes in polar co-ordinates.
➢ To understand the basic concepts of Trigonometry.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic concepts of differentiation, extreme functions of two variables.	**K3**
CO2	Apply the concept of differentiation for explaining curvature.	**K3**
CO3	Distinguish the trigonometric functions, related problems.	**K3**
CO4	Associate various types of hyperbolic and inverse hyperbolic functions and Solve problems in summation of trigonometric series.	**K4**
CO5	Examine the conceptual understanding and fluency with trigonometric functions, techniques and manipulations necessary for success in calculus.	**K4**

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

CORE COURSE-I (CC)
DIFFERENTIAL CALCULUS AND TRIGONOMETRY
SYLLABUS

UNIT I **(15 HOURS)**

Successive Differentiation: The nth derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the nth derivative of a product – A complete formal proof by induction.

Meaning of the Derivative: Geometrical interpretation – Meaning of the sign of the differential coefficient. Maxima and Minima of functions of two variables.

UNIT II **(15 HOURS)**

Curvature – Circle, radius and centre of curvature – Cartesian formula for the radius of curvature – The coordinates of the centre of curvature – Evolute and Involute - Radius of curvature when the curve is given in polar coordinates.

UNIT III **(15 HOURS)**

Expansions of $\cos n\theta$ and $\sin n\theta$ – Expansion of $\tan n\theta$ in powers of $\tan \theta$ – Expansion of $\tan(A + B + C + …)$ (omitting examples on formation of equations) - Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansion of $\sin^n \theta$ and $\cos^n \theta$ when n is a positive integer– Expansions of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ.

UNIT IV **(15 HOURS)**

Hyperbolic functions – Relation between hyperbolic functions – Inverse hyperbolic functions.

UNIT V **(15 HOURS)**

Logarithms of complex quantities - To find the logarithm of $x + iy$ – General value of logarithm of $x + iy$ – Summation of Trigonometrical Series – Method of differences – Some of series of n angles in arithmetic progression – Sum of cosines of n angles in arithmetic progression – Gregory's series.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S. Narayanan, T. K.Manicavachagom Pillay	Calculus, Volume I	S. Viswanathan (Printer & publishers), Pvt Ltd	2015
2.	S. Narayanan, T. K.Manicavachagom Pillay	Trigonometry	S. Viswanathan (Printer & publishers), Pvt Ltd	2013

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	3	1.1 – 1.6 [1]
	4	2.1 & 2.2 [1]
	8	4 & 4.1[1]
II	10	2.1 - 2.6 [1]
III	3	1, 2, 3, 4, 4.1, 5 & 5.1 [2]
IV	4	1, 2, 2.1 - 2.3 [2]
V	5	5, 5.1, 5.2 [2]
	6	1, 2, 3.1 [2]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	S. Arumugam and Issac	Calculus, Volume I	New Gamma Publishing House	1991
2.	S. Narayanan, T.K. Manichavasagam Pillai	Trigonometry	S. Viswanathan Pvt Limited and Vijay Nicole Imprints Pvt Limited	2004
3.	A.Singaravelu and R.Rama	Differential Calculus and Trigonometry	R publications, Nagapattinam	2003

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

CORE COURSE-II (CC)

INTEGRAL CALCULUS AND FOURIER SERIES

2019-2020 Onwards

Semester - I	INTEGRAL CALCULUS AND FOURIER SERIES	Hours/Week – 6	
CORE COURSE-II		**Credits – 6**	
Course Code – 19UMA1CC2		**Internal** 25	**External** 75

Objectives:

➢ To inculcate the basics of Integration and their applications.

➢ To introduce the order of Integration, Triple Integrals, Beta and Gamma functions.

➢ To understand the basic concepts of Fourier series.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the concepts of double, triple integrals.	**K3**
CO2	Distinguish the concepts of Beta and Gamma functions.	**K3**
CO3	Apply the concepts of half range Fourier series for solving problems necessary for success in calculus.	**K3**
CO4	Associate various types of Fourier series for solving problems.	**K4**
CO5	Evaluate the types of integration.	**K5**

Mapping with Programme Outcomes:

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

S - Strong, M - Medium, L - Low

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CORE COURSE-II (CC)

INTEGRAL CALCULUS AND FOURIER SERIES

SYLLABUS

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UNIT I   **(18 HOURS)**

Integration: Integration of rational algebraic functions $\int \frac{lx+m}{ax^2+bx+c}dx$ - Integration of Irrational functions $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ - Any expression of the form $\int \frac{dx}{(x-k)\sqrt{ax^2+bx+c}}$ - $\int \frac{dx}{a+b\cos x}$ (Integration of these types only)

UNIT II   **(18 HOURS)**

Multiple Integrals: Definition of the double integral - Evaluation of the double Integral- Triple Integrals.

UNIT III   **(18 HOURS)**

Improper Integrals: Beta and Gamma functions: Definitions - convergence of $\Gamma(n)$ - Recurrence formula of gamma functions - Properties of Beta functions - Relation between Beta and Gamma functions -Definite integrals using Gamma functions.

UNIT IV   **(18 HOURS)**

Fourier Series- Definition - Fourier Series expansion of periodic functions with period 2π - Even and Odd functions.

UNIT V   **(18 HOURS)**

Half-Range Fourier Series - Definition - Development in cosine series and sine series – Change of Interval - Combination of Series.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S. Narayanan, T.K.Manicavachagam Pillai.	Calculus Vol II	S. Viswanathan (Printer & publishers), Pvt Ltd	2015
2.	S. Narayanan, T.K.Manicavachagam Pillai.	Calculus Vol III	S. Viswanathan (Printer & publishers), Pvt Ltd	2014

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	7	7.3 (Type II)[1]
	8	Case II and case V[1]
	9	Full [1]
II	5	2.1, 2.2 & 4 [1]
III	7	2.1-2.3, 3 to 5 [1]
IV	6	1, 2, 3 [2]
V	6	4, 5.1, 5.2, 6, 7 [2]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	Shanti Narayan	Integral Calculus	S.Chand & Company Ltd	2002
2.	Shanti Narayan & P.K.Mittal	Integral Calculus	S.Chand & Company Ltd	2008
3.	U.P.Singh, R.J.Srivastava & N.H.Siddiqui	Integral Calculus	Wistom Press	2011
4.	J.K.Goyal & K.P.Gupta	Laplace and Fourier Transforms	Pragati Prakashan	2009

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

FIRST ALLIED COURSE-I (AC)
MATHEMATICAL STATISTICS – I
2019-2020 Onwards

Semester – I	MATHEMATICAL STATISTICS – I	Hours/Week – 5	
FIRST ALLIED COURSE-I		Credits – 3	
Course Code – 19UMA1AC1		Internal 25	External 75

Objectives:

> ➢ To learn the basic concepts of statistics.
> ➢ To learn the basic ideas of statistical tools.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the concept of probability theory and identify applications in real situations.	K2
CO2	Explain the derivation of moment generating function, characteristic function, probability generating function and the proof of Chebychev's inequality with its applications.	K2
CO3	Compute the index numbers by different types of methods.	K3
CO4	Define and Classify the two dimensional random variables.	K3
CO5	Interpret the various properties of expectation, variance and The concept of covariance.	K3
CO6	Distinguish between a discrete and a continuous random variable.	K4

Mapping with Programme Outcomes:

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
CO6	S	S	S	S	S

S- Strong; M-Medium; L-Low

FIRST ALLIED COURSE-I (AC)
MATHEMATICAL STATISTICS – I
SYLLABUS

UNIT I   **(15 HOURS)**

Theory of probability : Introduction – Short History – Definitions of Various Terms – Mathematical or Classical or 'a Priori' Probability – Statistical or Empirical Probability – Mathematical Tools: Preliminary Notion of sets – Sets and Elements of Sets – Operations on Sets – Algebra of Sets - Axiomatic approach to Probability – Random Experiment (Sample Space) – Event – Some Illustrations – Algebra of Events – Probability : Mathematical Notion – Probability Function – Laws of Addition of Probabilities – Extension of General Law of Addition of Probabilities – Law of Multiplication or Theorem of Compound Probability – Extension of Multiplication Law of Probability – Independent Events – Pair wise Independent Events – Mutually Independent Events – Baye's theorem.

UNIT-II   **(15 HOURS)**

Random Variables and Distribution Functions : Random Variable – Distribution Functions – Properties of Distribution Function – Discrete Random Variable – Probability Mass Function – Discrete Distribution Function – Continuous Random Variable – Probability Density Function – Various Measures of Central Tendency, Dispersion, Skewness and Kurtosis for Continuous Probability Distribution Function – Continuous Distribution Function – Joint Probability Mass Function and Marginal and Conditional Probability Function – Joint Probability Distribution Function – Joint Density Function, Marginal Density Function - Independent Random Variables – The Conditional Distribution Function and Conditional Probability Density Function.

UNIT-III   **(15 HOURS)**

Mathematical Expectation – Addition Theorem of Expectation – Multiplication Theorem of Expectation – Co-variance – Expectation of a Linear Combination of Random Variables – Variance of a Linear Combination of Random Variables – Expectation of a Continuous random variable – Conditional Expectation and Conditional Variance.

UNIT-IV   **(15 HOURS)**

Moment Generating Function – Theorems on moment Generating Functions–

Cumulants– Additive Property of Cumulants – Effect of Change of Origin and Scale of Cumulants – Characteristic Function – Properties of Characteristic Functions – Uniqueness Theorem of Characteristic Functions – Chebychev's Inequality – Weak Law of Large Numbers– Bernoulli's Law of Large Numbers.

UNIT-V   **(15 HOURS)**

Index numbers : Introduction – Meaning – Definition – Characteristics – Uses – Types of Index Numbers – Problems in the Construction of Index Numbers – Choice of Formula – Notations – Unweighted Index Numbers – Weighted Index Numbers – Quantity Index Numbers – Test of Consistency of Index numbers – Chain Base Method – Conversion of Chain Index into Fixed Index – Base Shifting – Splicing two Index Number Series – Deflating Index Numbers – Consumer Price Index – Meaning and Need – Uses – Construction of Consumer Price Index – Method of Constructing Consumer Price Index numbers – Aggregate Expenditure method – Family Budget method – Limitations of Index Numbers.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S.C.Gupta & V.K.Kapoor	Elements Of Mathematical Statistics	Sultan Chand & Sons, New Delhi	2004
2.	R.S.N.Pillai & Bhagavathi	Statistics, Theory And Practice	S.Chand & Sons, New Delhi	2008

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	4	4.1 to 4.8 [1]
II	5	5.1 to 5.5.5 [1]
III	6	6.1 to 6.8 [1]
IV	6	6.9 to 6.13.1 [1]
V	14	Full [2]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	S.C.Gupta & V.K.Kapoor	Fundamentals Of Mathematical Statistics	Sultan Chand & Sons.	2015
2.	T.Veerarajan	Probability, Statistics And Random Processes	Tata McGraw Hill education Private Limited	2010
3.	G.S.S.Bhisma Rao	Probability And Statistics	Scitech Publications (India) Pvt. Ltd	2011

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

SEMESTER II
CORE COURSE-III (CC)
ANALYTICAL GEOMETRY AND VECTOR CALCULUS
2020-2021 Onwards

Semester – II	ANALYTICAL GEOMETRY AND VECTOR CALCULUS	Hours/Week – 6	
CORE COURSE-III		**Credits – 6**	
Course Code – 20UMA2CC3		**Internal**	**External**
		25	75

Objectives:

- ➢ To understand the concepts and properties of analytical geometry.
- ➢ To understand the concepts of plane, straight line and sphere.
- ➢ To familiarize the students with the principles and practices of vector calculus.
- ➢ To familiarize the students with vector integration.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the coordinates in space, equation of a plane.	K3
CO2	Describe the concepts of straight lines and coplanar lines.	K3
CO3	Classify the equation of a sphere and tangent planes.	K3
CO4	Solve the problems of Gauss Divergence Theorem, Stokes Theorem- Green's Theorem.	K3
CO5	Examine the concepts of vector integration for finding scalar potential.	K4

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

ANALYTICAL GEOMETRY AND VECTOR CALCULUS

SYLLABUS

UNIT I: **(18 HOURS)**

Coordinate System: Introduction-Rectangular Cartesian Coordinates-Distance between two Points-Direction Cosines.

Planes: Equation of a Plane – Angle Between two Planes – Angle Bisectors of two Planes.

UNIT II: **(18 HOURS)**

Straight Lines: Equation of a Straight Line – A Plane and a Line – Equations of Two Skew Lines in a Simple form.

The Sphere: Introduction – Equation of a Sphere – Tangent Line and Tangent Plane – Section of a Sphere.

UNIT III: **(18 HOURS)**

Vector Differentiation: Introduction – Vector Algebra- Differentiation of Vectors – Gradient - Divergence and Curl.

UNIT IV: **(18 HOURS)**

Vector Integration - Line integrals-Normal Surface Integral $\int_S \vec{F}.\hat{n}dS$ -Flux across a Surface-Volume Integral $\int_V F.dv$

UNIT V: **(18 HOURS)**

Gauss's Divergence Theorem $\int_S \vec{F}.\hat{n}dS = \int_V div\,\vec{F}dv$ -Stoke's theorem $\int_C \vec{F}.\hat{n}d\vec{r} = \int_S curl\,\vec{F}.\hat{n}dS$ -Green's theorem-Stoke's theorem in space- Stoke's theorem in Cartesian form.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S. Arumugam and A. Thangapandi Isaac	Analytical Geometry 3D & Vector Calculus	New Gamma Publishing House, 2011	2011
2.	M.L.Khanna	Vector Calculus	Jai Prakash Nath and Co.,	2002

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	I	1.0 - 1.3 [1]
	II	2.1 - 2.3[1]
II	III	3.1 - 3.3 [1]
	IV	4.0 - 4.3 [1]
III	V	5.0 - 5.4 [1]
IV	III	1 – 4 [2]
V	III	5 – 8 [2]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	P.Duraipandiyan, Lakshmi Duraipandian and D.Muhilan	Analytical Geometry Three dimensionsal	Emerald Publishers	1984
2.	H.D.Pandey, M.Q.Khan and B.N.Gupta	A Text Book of Analytical Geometry and Vector Analysis	Wisdom Press	2011
3.	P.Duraipandiyan and Lakshmi Duraipandian	Vector Analysis	Emerald Publishers	1986

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

FIRST ALLIED COURSE – II (AP)

MATHEMATICAL STATISTICS – II (PRACTICAL)

2019-2020 Onwards

Semester – II	MATHEMATICAL STATISTICS – II (PRACTICAL)	Hours/Week – 5	
FIRST ALLIED COURSE-II		Credits – 3	
Course Code – 19UMA2AC1P		Internal 40	External 60

Objectives:

- ➢ To analyze the statistical problems.
- ➢ To provide the knowledge to interpret and solve the statistical problems.
- ➢ To ensure with the ideas of statistical tools.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify the discrete and continuous data and find average through the Measures of Central Tendency and Measures of Dispersion.	**K1**
CO2	Solve the problems in joint, Marginal and Conditional Probability distributions involving two random variables.	**K2**
CO3	Explain the various methods of finding Correlation and Regression co-efficient between two data sets and their applications.	**K2**
CO4	Describe and illustrate the concepts of fitting probability distributions.	**K2**
CO5	Analyze the concepts of testing of hypothesis and apply the test to the real life problems.	**K3**

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

FIRST ALLIED COURSE – II (AP)
MATHEMATICAL STATISTICS – II (PRACTICAL)
SYLLABUS

UNIT I

Measures of central tendency: Arithmetic Mean – Median – Quartiles – Deciles – Percentiles – Mode – Geometric Mean – Harmonic Mean – Measures of Dispersion: Range and Quartile Deviation – Mean Deviation – Standard Deviation –Co-efficient of variation – Skewness – Moments – Kurtosis.

UNIT II

Karl Pearson's Coefficient of Correlation – Rank correlation – Regression.

UNIT III

Theoretical Distributions: Binomial Distribution – Poisson Distribution – Normal Distribution.

UNIT IV

Two-dimensional Random Variables – Two-dimensional or Joint Probability Mass Function – Two-dimensional Distribution Function – Marginal Distribution Function – Joint Density Function, Marginal Density Function – The Conditional Distribution Function and Conditional Probability Density Function (Problems only).

UNIT V

Tests of Hypotheses: Test of Significance for Large Samples – Test of significance of the difference between sample proportion and population proportion – Test of significance of the difference between two sample proportions – Test of significance of the difference between sample mean and population mean – Test of significance of the difference between the mean two samples – Test of significance of the difference between sample S.D. and population S.D.– Test of significance of the difference between S.D.'s of two large samples – Test of Significance for small Samples : Tests of significance based on t-test for Mean – F-test for Variance - Chi-square test for goodness of fit and independence of attributes (Problems only).

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	R.S.N. Pillai and Bagavathi.	Practical Statistics	Sultan Chand & Sons.	2008
2.	S.C.Gupta & V.K.Kapoor	Fundamentals Of Mathematical Statistics	Sultan Chand & Sons.	2015
3.	T.Veerarajan	Probability, Statistics And Random Processes	Tata McGraw Hill education Private Limited	2010

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	3 , 4 , 5	FULL [1]
II	6 , 7	FULL [1]
III	13	FULL [1]
IV	5	5.5, 5.5.1-5.5.5 [2]
V	9	FULL [3]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	R.S.N.Pillai & Bhagavathi	Statistics, Theory And Practice	S.Chand & Sons	2008
2.	V.Rajagopalan	Selected Statistical Tools	New Age International (P) Ltd Publishers	2006
3.	G.S.S.Bhisma Rao	Probability and Statistics	Scitech Publications (India) Private Limited, New Delhi	2011

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

LIST OF PROGRAMS:

1) Arithmetic Mean, Geometric Mean and Harmonic Mean.
2) Median and Mode.
3) Quartile Deviation and Mean Deviation.
4) Standard Deviation and Co-efficient of Variation.
5) Karl Pearson's Co-efficient of Skewness.
6) Bowley's Co-efficient of Skewness.
7) Moments and Kurtosis.
8) Karl Pearson's Co-efficient of correlation.
9) Rank Correlation.
10) Fit a regression line.
11) Fit a Binomial distribution.
12) Fit a Poisson distribution.
13) Fit a Normal distribution.
14) Marginal and conditional distribution for X and Y.
15) Mathematical Expectation for X and Y.
16) Test the hypothesis of the difference between two sample means.
17) Test the hypothesis for single proportion.
18) Test the significance of hypothesis using 't' test.
19) Test the significance of hypothesis using 'F' test.
20) Test the significance of hypothesis using chi-square test.

FIRST ALLIED COURSE – III (AC)

MATHEMATICAL STATISTICS – III

2019-2020 Onwards

Semester – II	MATHEMATICAL STATISTICS – III	Hours/Week – 5	
FIRST ALLIED COURSE-III		Credits – 3	
Course Code – 19UMA2AC2		Internal 25	External 75

Objectives:

➢ To enable the students to learn the basic concepts of discrete distribution.

➢ To make the students analyze the concepts of continuous distribution.

➢ To ensure the students with the ideas of statistical tools.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Define the chi square Distribution and discuss the applications of chi square Distribution to conduct tests of goodness of fit and independence of attributes.	K2
CO2	Explain Student's t, Fisher's t and F statistics and derive their probability Distribution.	K2
CO3	Identify the concepts of a discrete probability Distribution and compute the moments, Cumulants, m.g.f and various constants of a discrete probability Distribution and its applications.	K3
CO4	Describe the concepts of a continuous probability Distribution and compute the moments, Cumulants, m.g.f and various constants of a continuous probability Distribution and its applications.	K3
CO5	Classify the various properties of the correlation and regression co- efficient and their applications.	K3

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

UNIT I   **(15 HOURS)**

Introduction – Discrete uniform Distribution – Bernoulli Distribution : Moments of Bernoulli Distribution - Binomial Distribution : Moments of Binomial Distribution – Recurrence Relation for the Moments of Binomial Distribution – Factorial Moments of Binomial Distribution –Mean Deviation about Mean of Binomial Distribution – Mode of Binomial Distribution – Moment Generating Function of Binomial Distribution – Additive Property of Binomial Distribution –Characteristic Function of Binomial Distribution – Cumulants of the Binomial Distribution –Poisson Distribution : The Poisson Process – Moments of the Poisson Distribution – Mode of the Poisson Distribution – Recurrence Relation for Moments of the Poisson Distribution – Moment Generating Function of the Poisson Distribution – Characteristic Function of the Poisson Distribution – Cumulants of the Poisson Distribution – Additive or Reproductive Property of Independent Poisson Variates – Probability Generating Function of Poisson Distribution.

UNIT II   **(15 HOURS)**

Introduction – Normal Distribution : Normal Distribution as a Limiting Form of Binomial Distribution – Chief Characteristics of the Normal Distribution and Normal Probability curve – Mode of Normal Distribution – Median of Normal Distribution – M.G.F. of Normal Distribution – Cumulant Generating Function (c.g.f.) of Normal Distribution – Moments of Normal Distribution – A Linear Combination of Independent Normal Variates – Points of Inflexion of Normal Curves – Mean Deviation About the Mean for Normal Distribution – Area Property (Normal Probability Integral) – Error Function – Importance of Normal Distribution – Fitting of Normal Distribution – Rectangular (or Uniform) Distribution : Moments ofRectangular Distribution – M.G.F. of Rectangular Distribution – Characteristic Function of Rectangular Distribution – Mean Deviation (about mean) of Rectangular Distribution.

UNIT III   **(15 HOURS)**

Gamma Distribution : M.G.F. of Gamma Distribution – Cumulants Generating Function of Gamma Distribution – Additive Property of Gamma Distribution – Beta Distributions of first kind : Constants of Beta Distributions of first kind – Beta Distributions of second kind : Constants of Beta Distributions of second kind – Exponential Distribution : Moment Generating Function of Exponential Distribution.

UNIT IV   **(15 HOURS)**

Correlation : Introduction – Meaning of Correlation – Scatter Diagram – Karl Pearson's Co-efficient of Correlation : Limits for Correlation Co-efficient – Assumptions Underlying Karl Pearson's Correlation Co-efficient – Rank Correlation : Spearman's Rank Correlation Co-efficient – Repeated Ranks – Repeated Ranks (continued) – Linear Regression : Introduction – Linear Regression : Regression Co-efficient - Properties of Regression Co-efficient – Angle between two lines of Regression – Standard Error of Estimate or Residual Variance – Correlation Co-efficient between Observed and Estimated Values.

UNIT V   **(15 HOURS)**

Chi-Square Distribution : Introduction – Derivation of the Chi-Square Distribution –M.G.F. of Chi-Square Distribution : Cumulant Generating Function of χ^2 Distribution – Limiting Form of χ^2 Distribution for large degree of Freedom –Characteristic Function of χ^2 Distribution – Mode and Skewness of χ^2 Distribution – Additive Property of χ^2 Variates – Chi- Square Probability Curve – Students'' Distribution : Introduction – Derivation of the Students't' Distribution – Fisher's't' – Distribution of Fisher's't' – Constants of t-distribution – Limiting Form of 't' Distribution – Graph of 't' Distribution – Critical Values of t – F-Distribution : Derivation of Snedecor's F- Distribution – Constants of F– Distribution – Mode and Points of Inflexion of F- Distribution – Relation between t and F Distributions – Relation between F and χ^2 Distributions.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S.C.Gupta & V.K.Kapoor	Fundamentals Of Mathematical Statistics	Sultan Chand & Sons.	2015

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	8	8.1 to 8.5.9 (omit 8.4.10 to 8.4.12 and 8.5.10) [1]
II	9	9.1 to 9.3.4 (omit 9.2.15) [1]
III	9	9.5 to 9.8.1 [1]
IV	10 11	10.1 to 10.4.2 & 10.7, 10.7.1 to 10.7.3 [1] 11.1 to 11.2.5 [1]
V	15 16	15.1 to 15.3.6 [1] 16.1 to 16.2.7, 16.5, 16.5.1 to 16.5.3, 16.7, 16.8 [1]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	S.C.Gupta & V.K.Kapoor	Elements Of Mathematical Statistics	Sultan Chand & Sons	2004
2.	R.S.N.Pillai & Bhagavathi	Statistics, Theory And Practice	S.Chand & Sons	2008
3.	G.S.S.Bhishma Rao	Probability And Statistics	Scitech Publications (India) Pvt Ltd	2011

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

SEMESTER III

CORE COURSE-IV (CC)

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

2019-2020 Onwards

Semester – III	DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	Hours/Week – 5	
CORE COURSE-IV		Credits – 5	
Course Code – 19UMA3CC4		Internal 25	External 75

Objectives:

➢ To give an in-depth knowledge of solving Ordinary differential equations including separable, homogeneous, exact, and linear.
➢ To acquire the knowledge of solving problems using partial differential equations.
➢ To know the concepts of Laplace transforms and the Inverse Laplace transforms with applications.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Define Laplace transform & its inverse.	K1
CO2	Illustrate the notion of order & degree of the ordinary differential equations.	K2
CO3	Rephrase the partial differential equations by eliminating constants and arbitrary functions.	K2
CO4	Apply the method of variation of parameters for finding the solutions of second order ordinary differential equations.	K3
CO5	Compute general, singular & particular integrals for standard forms.	K3
CO6	Solve the ordinary differential equations by Laplace Transforms and inverse Laplace transforms.	K3

Mapping with Programme Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	M	M	M	M	S
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	S	M
CO6	S	S	S	S	M

S-Strong, M-Medium, L-Low

CORE COURSE-IV (CC)
DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS
SYLLABUS

UNIT – I: (15 HOURS)

Equations of the first order but of higher degree:

Equations solvable for dy/dx – Equations solvable for y – Equations solvable for x – Clairaut's form – Extended form of Clairaut's form – Exact differential equations – Conditions of integrability of $M\,dx + N\,dy = 0$ – Practical rule for solving an exact differential equation – Rules for finding integrating factors – simple problems.

UNIT –II: (15 HOURS)

Linear equations with constant coefficients:

Definition – The operator D – Complementary function of a linear equation with constant coefficients – Particular integral – General method of finding P.I. – Special methods for finding P.I. of the forms e^{ax}, $\cos ax$ or $\sin ax$, $e^{ax}V$, x^m – Linear equations with variable coefficients – Methods of finding particular integrals – Special method of evaluating the P.I. when X is of the form x^m – Method of Variation of Parameters (Omit third & higher order equations).

UNIT –III: (15 HOURS)

Partial differential equations of the first order:

Classification of Integrals – Derivation of partial differential equations – By elimination of constants – By elimination of an arbitrary function – Lagrange's method of solving the linear equation – Special methods for some standard forms $F(p,q) = 0, F(x, p, q) = 0, F(y, p, q) = 0, F(z, p, q) = 0, f_1(x, p) = f_2(y, q)$ – Clairant's form – Equations reducible to the standard forms – Charpit's method – Solving of few standard forms from Charpit's method.

UNIT – IV: (15 HOURS)

Partial differential equations of higher order:

Introduction – Homogeneous differential equation – Methods of finding C.F. – Methods of finding P.I. of the forms $e^{ax + by}$, $x^r y^s$, $\sin(ax + by)$ or $\cos(ax + by)$, $e^{ax + by} \phi(x, y), \sin ax \sin by$ or $\cos ax \cos by$.

UNIT – V: (15 HOURS)

Laplace transforms & inverse laplace transforms:

Definition – Piecewise continuity – Sufficient conditions for the existence of the Laplace Transforms – Basic results – Laplace Transform of periodic functions – Some general theorems & simple applications – Evaluation of certain integrals using Laplace Transform –

The Inverse Laplace Transforms –Modification of results in Laplace Transform to get the inverse Laplace Transform – Use of Laplace Transforms in solving ODE with constant coefficients.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S.Narayanan & T.K.Manicavachagom Pillay	Differential Equations And Its Applications	S.Viswanathan Publishers Pvt. Ltd	2016
2.	Dr.S.Arumugam & Mr.A.Thangapandi Isaac	Differential Equations And Applications	New Gamma publishing House	2014

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	4	1-3 [1]
	2	6 [1]
II	5	1-5 [1]
	8	4 [1]
III	12	1-6 [1]
IV	5	1-2 [2]
V	9	1-8 [1]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	M.D.Raisinghania	Ordinary and Partial Differential Equations	S.Chand & Company	2008

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

CORE COURSE-V (CC)

CLASSICAL ALGEBRA AND THEORY OF EQUATIONS

2019-2020 Onwards

Semester - III	CLASSICAL ALGEBRA AND THEORY OF EQUATIONS	Hours/Week – 5	
CORE COURSE-V		Credits – 5	
Course Code – 19UMA3CC5		Internal 25	External 75

Objectives:

- ➢ To establish a sound knowledge on theory of equations.
- ➢ To inculcate the students in applicable algebra.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain relation between roots and co-efficients of Polynomial equations.	K2
CO2	Apply symmetric functions in solving equations and find sum of rth power of roots.	K3
CO3	Compute transformation of equations and solve Reciprocal equations.	K3
CO4	Interpret the quotient and remainder, Find removal of terms and form an equation whose roots are any power.	K2
CO5	Describe transformation in general with Descarte's rule of signs.	K2
CO6	Classify inequalities in all manners.	K3
CO7	Explain theory of numbers with its applications.	K2

Mapping with Programme Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	S
CO5	S	S	M	S	M
CO6	S	S	S	S	S
CO7	S	S	S	S	S

S-Strong, M-Medium, L-Low

CORE COURSE-V (CC)
CLASSICAL ALGEBRA AND THEORY OF EQUATIONS
SYLLABUS

UNIT I   **(15 HOURS)**

Relation between the roots and coefficients of Equations – Symmetric function of the roots – Sum of the powers of the roots of an equation.

UNIT II   **(15 HOURS)**

Newton's theorem on the sum of the power of the roots-Transformations of Equations– Reciprocal equations – To increase or decrease the roots of a given equation by a given quantity.

UNIT III   **(15 HOURS)**

Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms – To form of an equation whose roots are any power of the roots of a given equation – Transformation in general – Descarte's rule of signs.

UNIT IV   **(15 HOURS)**

Inequalities – Elementary principles – Geometric & Arithmetic means – Weirstrass inequalities – Cauchy inequality – Applications to Maxima & Minima.

UNIT V   **(15 HOURS)**

Theory of Numbers – Prime & Composite numbers – divisors of a given number N – Euler'sFunction (N) and its value –Integral part of a real number – The highest Power of a prime P contained in n! – Congruences –Fermat's, Wilson's & Lagrange's Theorems.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	T.K.Manickavasagam Pillai & others	Algebra, Volume I	S.V. publications	1985
2.	T.K.Manickavasagam Pillai & others	Algebra, Volume I	S.V. publications	1985

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	6	11-13 [1]
II	6	14-17 [1]
III	6	18-21 & 24[1]
IV	4	1-13 [2]
V	5	1-18 [2]

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	H.S.Hall & S.R.Knight	Higher Algebra	Prentice Hall of India, New Delhi	1948
2.	Barnard S & Child	Higher Algebra	J.M.Publication	1936

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

SECOND ALLIED COURSE-I (AC)

PYTHON PROGRAMMING

2021-2022 Onwards

Semester - III	PYTHON PROGRAMMING	Hours/Week – 4	
Second Allied Course-I		Credits – 4	
Course Code – 21UMA3AC3		Internal	External
		25	75

Objectives:

- To understand the concepts of Python programming language.

- To provide basic idea on user defined functions of Python programming.

- To inculcate the uses of built in data types of Python programming on real time data.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Understand Python's core data types, input and output statements	K2
CO2	Demonstrate different decision making statements	K2
CO3	Explain Loop control statements and functions	K2
CO4	Apply the List, Tuple and Dictionaries concepts	K3

Mapping With Programme Outcomes*:*

Cos/Pos	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	M	M	M	M	M
CO3	M	S	S	M	M
CO4	S	S	M	M	M

S – Strong; M – Medium; L – Low

<div align="center">**SECOND ALLIED COURSE-I (AC)**

PYTHON PROGRAMMING

SYLLABUS</div>

UNIT - I:

Basics of Python Programming   **(12 HOURS)**

Introduction- Python Character Set-Token-Python Core Data Type- The print () Function- Assigning value to a variable-Multiple Assignments- Writing Simple Programs in Python- The input() Function –Formatting Number and String

UNIT - II: Operators, Expressions and Decision Statements   **(12 HOURS)**

Operators and Expressions:

Introduction- Operators and Expressions- Arithmetic Operators- Operator Precedence and Associatively-Bitwise Operator.

Decision Statements:

Introduction-Boolean Operators- Using Numbers with Boolean Operators- Using String with Boolean Operators- Boolean Expressions and Relational Operators-Decision Making Statements

UNIT - III: Loop Control Statements and Functions   **(12 HOURS)**

Loop Control Statements:

Introduction-The while Loop-The range () function-The for Loop- Nested Loops-The break Statement- The continue Statement.

Functions:

Introduction-Syntax and Basics of a Function- Use of a Function- Parameters and Arguments in a Function-The return Statement- The Lambda Function

UNIT - IV: Strings and Lists   **(12 HOURS)**

Strings:

Introduction- The Str Class- the basic inbuilt python functions for string- the index [] operator- Traversing string with for and while loop- Immutable strings- The string operators-String operations.

Lists:

Introduction-Creating Lists-Accessing the elements of the List – Python inbuilt functions for Lists-List operator-List methods

UNIT - V: Tuples, Sets, Dictionaries   **(12 HOURS)**

Tuples, Sets and Dictionaries:

Introduction to Tuples-Sets-Dictionaries.

TEXT BOOK:

1. Ashok Namdev Kamthane and Amith Ashok Kamthane, "**Programming and Problem Solving with PYTHON**", McGraw Hill Education (India) Private Limitted. ©2018.

REFERENCE BOOKS:

1. Dr.R. Nageswara Rao Core Python Programming Dreamtech Press 2017.

2. Ch Satyanarayana, M Radhika Mani & B N Jagadesh, "Python Programming", Universities Press, 2018.

3. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with Python", Khanna Book Publising Co. (P) Ltd., 2016.

WEB LINKS:

1. www.learnpython.org/
2. https://www.codecademy.com/learn/python
3. https://www.Codementor.io
4. https://www.Python.org

PEDAGOGY:

Power point Presentation, Assignments, Group Discussion and e-contents.

COURSE DESIGNER:

Mrs.K.Akila, Assistant Professor, Department of Computer Applications

PYTHON PROGRAMMING LAB

2021-2022 Onwards

Semester - III	PYTHON PROGRAMMING LAB	Hours/Week – 2	
Second Allied Course-II		Credits – 2	
Course Code – 21UMA3AC2P		Internal	External
		40	60

OBJECTIVE:

- To know the basics of problem solving.
- To understand and write simple python programs.
- To develop python programs with decision making and conditional loops.
- To create user defined functions on python.

COURSE OUTCOME:

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

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand and apply Python's basic concepts	K2
CO2	Demonstrate different data types and its usage	K2
CO3	Use the knowledge of functions	K3

MAPPING WITH PROGRAMME OUTCOMES:

Cos/Pos	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	M
CO2	M	M	M	M	M
CO3	S	S	S	M	M

S- Strong**; M-**Medium**; L-**Low

LIST OF PRACTICALS

1. Get inputs from user and display them
2. Develop a calculator

3. Implement Decision making and Loop control statements
4. Create and call an user defined function
5. Strings and their built-in functions
6. List and their built-in functions
7. Working with Tuples
8. Working with Dictionaries

WEB REFERENCES:
1. https://www.programiz.com/python-programming
2. https://www.tutorialspoint.com/python
3. https://www.w3schools.com/python

PEDAGOGY:

Power Point Presentation, Demonstration

NON-MAJOR ELECTIVE COURSE – I (NME)

MATHEMATICS FOR COMPETITIVE EXAMINATION-I

2019-2020 Onwards

Semester - III	MATHEMATICS FOR COMPETITIVE EXAMINATION-I	Hours/Week – 2	
NON-MAJOR ELECTIVE COURSE – I		Credits – 2	
Course Code – 19UMA3NME1		**Internal** 25	**External** 75

Objectives:

➢ To provide the knowledge to analyze, interpret and solve the Mathematical problems.

➢ To develop the thinking capacity to solve the problems.

➢ To study many short tricks to solve the mathematical problems easily.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Solve the Problems on Numbers and Problems on Ages.	**K2**
CO2	Explain the concept of time and distance, Calendar and Clock.	**K2**
CO3	Apply the concept of Data Interpretation in various types of Graphs.	**K3**
CO4	Distinguish the concept of Series Codes, Relationships, Analogy and Classification.	**K3**
CO5	Explain the concept of Logical Reasoning.	**K3**

Mapping With Programme Outcomes:

Cos/Pos	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	M	S	S	S	S
CO3	S	S	M	M	S
CO4	S	S	M	M	M
CO5	S	S	S	S	M

S – Strong;   M – Medium;   L – Low

MATHEMATICS FOR COMPETITIVE EXAMINATION-I

SYLLABUS

UNIT I   **(6 HOURS)**

Problems on Numbers – Problems on Ages.

UNIT II   **(6 HOURS)**

Time and Distance – Calendar – Clocks.

UNIT III   **(6 HOURS)**

Data Interpretation: Tabulation – Bar Graphs – Pie Charts – Line Graphs.

UNIT IV   **(6 HOURS)**

Reasoning (Including Mathematical): Series – Codes – Relationship – Analogy – Classification.

UNIT V   **(6 HOURS)**

Logical Reasoning.

Text Books:

S. No	Authors	Title of the Book	Publishers/Edition	Year of Publication
1.	R. S.Aggarwal	Quantitative Aptitude – For Competitive Examinations (Fully Solved)	S.Chand & Company Pvt.Ltd,	Reprint 2015
2.	Dr. K.Kautilya	UGC NET/JRF/SET Teaching & Research Aptitude (General Paper - I)	UPKAR PRAKASHAN, AGRA – 2, Sixth Edition	2017

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	7, 8	161 – 194 [1]
II	17	384 – 404 [1]
	27,28	593 – 604 [1]
III	36,37,38,39	659 – 726 [1]
IV	5	132 – 161 [2]
V	6	162 – 190 [2]

REFERENCE BOOKS:

S. No	Authors	Title of the Book	Publishers/ Edition	Year of Publication
1.	Edgar Thorpe	Test of Reasoning for Competitive Examinations	Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd Edition,	3rd Re-Print 2000.
2	T.K. Sinha	80+ Practice Sets of Quantitative Aptitude for Bank PO Exams	Arihant Publication (India) limited	2002.

Pedagogy:

Chalk and Talk, PPT, Discussion and Quiz

SEMESTER IV

CORE COURSE VI – (CC)

SEQUENCES AND SERIES

2021-2022 Onwards

Semester - IV		Hours/Week – 6	
Core Course – VI	SEQUENCES AND SERIES	Credits – 5	
Course Code – 21UMA4CC6		Internal 25	External 75

Objectives:

➢ To lay a good foundation for classical analysis.

➢ To study the behavior of sequences and series.

➢ To acquire the knowledge of solving problems in Binomial, Logarithm & Exponential Series.

Course Outcomes:

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

CO No.	CO Statement	Knowledge Level
CO1	Explain the concepts of convergent sequences, divergent sequences and series.	K2
CO2	Apply the ideas of sequences in Algebra of limits.	K3
CO3	Compute the behavior of monotonic functions.	K3
CO4	Apply the theory of Cauchy's condensation test and Cauchy's root test on series.	K3
CO5	Solve the problems based on binomial, logarithmic and exponential series.	K3
CO6	Examine infinite series using D' Alembert's ratio test.	K4

Mapping with Programme Outcome:

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	M	S	S	S
CO6	S	S	S	S	M

S-Strong, M-Medium, L-Low

CORE COURSE VI – (CC)
SEQUENCES AND SERIES
SYLLABUS

UNIT – I   **(15 Hours)**

Introduction – Sequences – Bounded Sequences – Monotonic Sequences – Convergent Sequences – Divergent and Oscillating Sequences – The Algebra of Limits.

UNIT –II   **(15 Hours)**

Behavior of Monotonic sequences – Some theorems on limits –Subsequences.

UNIT –III   **(15 Hours)**

Infinite Series – Definition of Convergence, Divergence & Oscillate – Convergence of Geometric series – Some general theorems concerning infinite series – Series of positive terms – Comparison tests- convergence of $\sum \dfrac{1}{n^k}$ – D' Alembert's Ratio test.

UNIT – IV   **(10 Hours)**

Cauchy's Condensation test – Cauchy's Root test and simple problems – Absolute Convergence – Conditional Convergence – Alternative Series.

UNIT – V   **(20 Hours)**

Binomial theorem for a rational index – Some important particular case of the Binomial expansion – Sign of terms in binomial expansion – Numerically greatest term expansions – Method of splitting functions into partial fractions – Application of the Binomial theorem to the summation of series – Approximate values – Exponential limit – The Exponential theorem – Summation – The Logarithmic series – Modification of the logarithmic series – Summation of series– Euler's constant – Series which can be summed up by the logarithmic series – Calculation of logarithms by means of the logarithmic series.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	Dr.S.Arumugam & Prof.A.Thangapandi Isaac	Sequences and Series	New Gamma Publishing House	2015
2.	T.K.Manicavachagom Pillay, T.Natarajan & K.S.Ganapathy	Algebra, Volume I	S.Viswanathan Pvt Limited	2015

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	3	3.0-3.6 [1]
II	3	3.7-3.9 [1]
III	2	8-14, 16 [2]
IV	2	15, 17, 21-24 [2]
V	3	5-10, 14 [2]
	4	1-3, 5-10 [2]

REFERENCE BOOKS:

S.No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	M.K.Singal & Asha Rani Singal	A First Course in Real Analysis	R. Chand &co	2018
2.	N.P.Bali	Golden Maths series -Real Analysis	Laxmi Publication	2019

Web links:

1. https://youtu.be/JKiwztS6e_s
2. https://youtu.be/A02NqndQan0
3. https://youtu.be/9sLsX9DV5Fs
4. https://youtu.be/Q3_IGStTGVQ
5. https://youtu.be/BydVprh9NgQ

Pedagogy:

Power point presentation, Group Discussion, Seminar, Assignment.

CORE COURSE – VII (CC)

METHODS IN NUMERICAL ANALYSIS

2021-2022 Onwards

Semester – IV		Hours/Week –4	
Core Course – VII	METHODS IN NUMERICAL ANALYSIS	Credits – 3	
Course Code – 21UMA4CC7		Internal 25	External 75

Objectives:

➢ To introduce the basic concepts of solving algebraic and transcendental equations.

➢ To introduce the numerical techniques of interpolation in various intervals.

➢ To understand the knowledge of numerical techniques of differentiation and integration.

Course Outcomes:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply numerical methods to solve Algebraic, Transcendental equations.	K2
CO2	Explain and solve the numerical techniques of interpolation in various intervals.	K2
CO3	Solve numerical integration and differentiation.	K3
CO4	Solve the system of linear equation with understanding by appropriate methods.	K3
CO5	Compute the numerical solution of ordinary differential equation by various methods.	K3

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

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CORE COURSE – X (CC)

METHODS IN NUMERICAL ANALYSIS

SYLLABUS

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UNIT I (15 Hours)

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction – Method of False Position – Iteration Method – Newton-Raphson Method – Ramanujan's Method – Secant Method – Muller's Method.

UNIT II (15 Hours)

INTERPOLATION:

Introduction – Errors in Polynomial Interpolation – Finite Differences –Newton's Formulae for Interpolation – Interpolation with Unevenly Spaced Points: Lagrange's Interpolation Formula – Divided Differences and Their Properties: Newton's General Interpolation Formula.

UNIT III (15 Hours)

NUMERICAL DIFFERENTIATION AND INTEGRATION:

Introduction – Numerical Differentiation – Numerical Integration: Trapezoidal Rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule – Boole's and Weddle's Rules –Use of Cubic Splines – Romberg Integration – Newton-Cotes Integration Formulae.

UNIT IV (15 Hours)

NUMERICAL LINEAR ALGEBRA:

Introduction – Solution of Linear Systems – Direct Methods : Gauss Elimination – Necessity for pivoting – Gauss-Jordan Method – Modification of the Gauss Method to Compute the Inverse – Solution of Linear Systems – Iterative Methods.

UNIT V   **(15 Hours)**

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

      Introduction – Solution by Taylor's Series – Picard's Method of Successive Approximations – Euler's Method: Modified Euler's Method, Runge - Kutta Methods – Predictor – Corrector Methods.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S. S. Sastry	Introductory Methods of Numerical Analysis	Fifth Edition , PHI Learning Private Limited, Delhi	2018

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTION
I	2	2.1, 2.3 – 2.8
II	3	3.1 – 3.3, 3.6, 3.9 (3.9.1 Only) & 3.10 (3.10.1 Only)
III	6	6.1, 6.2 & 6.4
IV	7	7.1, 7.5 (7.5.1– 7.5.4) & 7.6
V	8	8.1–8.3, 8.4(8.4.2 Only), 8.5 & 8.6

REFERENCE BOOKS:

S.No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	M.K. Jain, S.R.K. Iyengar and R.K. Jain	Numerical Methods for Scientific and Engineering Computations	New Age International Private Limited	1999
2.	C.E. Froberg	Introduction to Numerical Analysis	II Edition , Addison Wesley	1979
3.	Dr. P. Kandasamy, Dr.K. Thiligavathy and Dr.K. Gunavathi	Numerical Methods	S. Chand & Company Pvt.	2013

Web links:

1. https://www.youtube.com/watch?v=3j0c_FhOt5U

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

3. https://www.youtube.com/watch?v=0rtaUUonwkU

4. https://nptel.ac.in/courses/111/107/111107106/

5. https://www.youtube.com/watch?v=QugqSa3Gl-w

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

Semester – IV	INTERNET OF THINGS	Hours/Week – 4	
Second Allied Course - III		**Credits – 3**	
Course Code – 21UMA4AC4		**Internal** **25**	**External** **75**

Objectives

➢ To study fundamental concepts of IoT

➢ To understand roles of sensors and learn different protocols used for IoT

➢ To apply the concept of Internet of Things in the real-world scenario

Course Outcome

CO No.	CO Statement	Knowledge Level
CO1	Understand building blocks of Internet of Things and characteristics	K2
CO2	Analyze basic protocols in wireless sensor network	K4
CO3	Illustrate different sensor technologies for sensing real world entities and identify the applications	K3
CO4	Demonstrate the ability to transmit data wirelessly between different devices	K3
CO5	Design IoT applications in different domain and be able to analyze their performance	K5

Mapping with Programme Outcomes

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

S-Strong, M-Medium, L-Low

INTERNET OF THINGS
SYLLABUS

Unit I :   **(12 HOURS)**

Introduction to Internet of Things:

Introduction – Overview of Internet of Things (IoT) - Characteristics of IoT - IOT Applications, Working and Implementation of IoT - Components of an IoT System - IoT Architecture and Levels - IoT Ecosystem - Value chain and global value chain - Types of Networks – IoT Technologies and Protocols – Technologies used in IoT.

Unit II :   **(12 HOURS)**

Communication Protocols – IOT Enabling Technologies – Building blocks of IoT – The logical and Physical design of IoT – Functional blocks of IoT – IoT design Methodology – Communication models – Development tools used in IoT – SDN and NFV for IoT

Unit III :   **(12 HOURS)**

Things and Connections:

Introduction to control systems – Working of controlled systems – Feedback systems – Connectivity models – OSI Model – TCP/IP model – Types of modes – Wired and Wireless Methodology – Transmission media – Guided media – Unguided media – The process flow of IoT.

Unit IV :   **(12 HOURS)**

Sensors, Actuators and Microcontrollers:

Introduction – Sensor – Classification of Sensors – Types of Sensors – Criteria to choose a Sensor – Actuators – Classification of Actuators – Microcontroller – Classification of Microcontrollers – Components of Microcontroller – Types of Microcontrollers – Application of Microcontroller – Embedded System – Real time Embedded system – Microprocessor – Evolution of Microprocessor – Major parts of Microprocessor – Characteristics of Microprocessor – Classification of Microprocessors – CISC – RISC – EPIC – Architecture of Microprocessor – Microprocessor vs Microcontroller.

Unit V: **(12 HOURS)**

Building IoT Applications :

Introduction to Arduino – Types of Arduino Boards – Introduction to Arduino IDE – Parts of Arduino IDE – Development Cycle – Writing/Editing Code in Sketch – Compling – Debugging – Uploading and Running a File – Role of Serial Monitor – Role of Serial Plotter – LED Programming – Open Your First Sketch.

Text Books:

S.NO.	AUTHORS	TITLE	PUBLISHERS
1	Prof. Satish Jain & Shashi Singh	IoT and its Applications	BPB Publications

Chapters and Sections:

UNIT	CHAPTER	SECTIONS
I	1	1.1 – 1.12
I	1	1.13 – 1.21
II	2	2.1 – 2.12
III	3	3.1 – 3.24
IV	4	4.1 – 4.12

Reference Book:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Arshdeep Bahga and Vijay Madisetti	Internet of Things A Hands-on Approach	Universities Press	2014
2	Raj Kamal	Internet of Things Architecture and Design Principles	Mc Graw Hill Education (India) Private Limited	2017
3	Preston Gralla	How the Internet Works	Pearson Education	2012

Web links

1. https://iotbyhvm.ooo/physical-design-of-iot/
2. https://www.javatpoint.com/iot-internet-of-things
3. https://www.oracle.com/in/internet-of-things/what-is-iot/
4. https://www.edureka.co/blog/iot-applications/
5. https://www.rfpage.com/applications-of-internet-of-things-iot/

Pedagogy

Power point presentation, Seminar and Quiz

SKILL BASED ELECTIVE – I (A)

INTRODUCTION TO R

2021-2022 Onwards

Semester – IV	INTRODUCTION TO R	Hours/Week – 2	
Skill Based Elective –I(A)		Credits – 2	
Course Code – 21UMA4SBE1A		Internal 25	External 75

Objectives:

➢ To explore and understand how to use the R documentation.

➢ To master the use of the R and R Studio interactive environment.

➢ To understand how to create and manipulate data's in R.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Navigate in the R Studio interface.	K2
CO2	Explain concepts of matrices and arrays.	K3
CO3	Discuss about List and data frames.	K3
CO4	Apply R effectively to analyze and visualize data.	K3
CO5	Classify various testing of hypothesis.	K2

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

UNIT I (6 Hours)

Getting Started:

Obtaining and Installing R from CRAN – Opening R for the First Time – Saving Work and Exiting R – Conventions.

Numerics, Arithmetic, Assignment and Vectors:

R for Basic Math – Assigning Objects – Vectors.

UNIT II (6 Hours)

Matrices and Arrays:

Defining a Matrix – Subsetting – Matrix Operations and Algebra – Multidimensional Arrays.

Non-Numeric Values:

Logical Values – Characters.

UNIT III (6 Hours)

Lists and Data Frames:

Lists of Objects – Data Frames.

Special Values, Classes and Coercion:

Some Special Values – Understanding Types, Classes and Coercion.

UNIT IV (6 Hours)

Elementary Statistics:

Describing Raw Data – Summary Statistics.

Basic Data Visualization:

Barplots and Pie Charts – Histograms – Box-and-Whisker Plots – Scatter Plots.

UNIT V (6 Hours)

Common Probability distributions:

Common Probability Mass Functions – Common Probability Density Functions.

Hypothesis Testing:

Components of a Hypothesis Test – Testing Means – Testing Proportions – Testing Categorical Variables – Errors and Power.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	Tilman M. Davies	The Book of R A First Course in Programming and Statistics	No Starch Press Inc.,	2016

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	1	1.1 -1.4
	2	2.1 -2.3
II	3	3.1 - 3.4
	4	4.1 - 4.2
III	5	5.1 & 5.2
	6	6.1 & 6.2
IV	13	13.1 & 13.2
	14	14.1 – 14.4
V	16	16.1 & 16.2
	18	18.1 – 18.5

REFERENCE BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year ofPublication
1	Dr. Mark Gardener	Beginning R The Statistical Programming Language	John Wiley & Sons, Inc	2012
2	Joseph Schmuller	Statistical Analysis R for Dummies	John Wiley & Sons, Inc	2017
3	Andy Field Jeremy miles Zoe Field	Discovering Statistics Using R	Sage Publications Ltd	2012

Web links:

1. https://youtu.be/V8eKsto3Ug

2. https://youtu.be/RwDV802ckU8

3. https://youtu.be/fDRa82lxzaU

4. https://youtu.be/lL0s1coNtRk

5. https://youtu.be/SJpd7KC18fQ?list=PLJ5C6qdAvBFfF7qtFi8PvRK8x55jsUQ

Pedagogy:

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

SKILL BASED ELECTIVE- I (B)

INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS

2021-2022 Onwards

Semester – IV	INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS	Hours/Week – 2	
Skill Based Elective- I (B)		Credits – 2	
Course Code – 21UMA4SBE1B		Internal 25	External 75

Objectives:

- ➢ To learn basic data analysis and interpretation with SPSS.

- ➢ To manipulate and transform variables in SPSS.

. ➢ To establish a sound knowledge on SPSS.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the objectives of SPSS.	K2
CO2	Apply SPSS for data interpretation.	K3
CO3	Compute various test using SPSS.	K3
CO4	Interpretation of several graphs in SPSS.	K2
CO5	Classify Data View, Variable View and Output View Screens.	K2

Mapping With Programme Outcomes:

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

S – Strong , M – Medium, L– Low

SKILL BASED ELECTIVE- I (B)
INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS
SYLLABUS

UNIT I   (6 hours)

First Encounters:

   Introduction and objectives- Entering, Analyzing and Graphing Data

Navigating in SPSS:

   SPSS variable View screen-SPSS data view screen-SPSS Main menu- Data Editor Toolbar – Short tour of variable View screen.

UNIT II   (6 hours)

Getting Data In and Out of SPSS:

   typing data using the computer keyboard- Saving your SPSS   Data   and   Output files- Opening your saved SPSS files – opening   SPSS sample files- Copying and pasting data to other applications-Importing files from other applications- Exporting SPSS files to other applications.

Levels of Measurement:

   Variable view screen**:** Measure column -Variables measured at the Nominal level- Variables measured at the Ordinal level- Variables measured at the Scale level.

UNIT III   (6 hours)

Entering Variables and Data and Validating Data:

   Entering Variables and assigning attributes (Properties)-Entering Data for each variable – Validating Data.

Working with Data and Variables:

Computing a new variable   - Recoding Scale Data into a String Variable- Inserting new variables and Cases in to Existing Databases- Data View page: Copy, Cut and Paste procedures.

UNIT IV **(6 hours)**

Using the SPSS Help Menu:

Help Options – Using Help Topics – Using Help Tutorial – Using Help Case Studies – Getting Help When Using Analyze on the Main Menu.

Creating Basic Graphs and Charts:

Using Legacy Dialogs to Create a Histogram – Using Chart Builder to Create a Histogram – Using Legacy Dialogs to Create a Bar Graph – Using Chart Builder to Create a Bar Graph - Using Legacy Dialogs to Create a line Graph - Using Chart Builder to Create a line Graph - Using Legacy Dialogs to Create a Pie Chart - Using Chart Builder to Create a Pie Chart.

UNIT V **(6 hours)**

Editing and Embellishing Graphs:

Creating a Basic Graph – Editing a Basic Graph – Editing a Three-Dimensional Graph – Exporting Graphs to Documents.

Printing Data View, Variable View and Output Viewers Screens:

Printing Data From the Variable View Screen – Printing Variable Information From and Output Viewer – Printing Tables From and Output Viewer.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	James B. Cunningham & James O. Aldrich	An Interactive Hands-on Approach	SAGE Publications India Pvt Ltd, New Delhi	2012

CHAPTERS AND SECTIONS:

UNIT	CHAPTERS	SECTIONS
I	1 & 2	1.1-1.2, 2.1-2.6
II	3 & 4	3.1-3.8, 4.1-4.5
III	5 & 6	5.1-5.4, 6.1-6.5
IV	7 & 8	7.1- 7.6, 8.1-8.9
V	9 & 10	9.1-9.5 10.1-10.4

REFERENCE BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	Keith McCormick & Jesus Salcedo with Aaron Poh	SPSS Statistics for Dummies	Wiley India Pvt Ltd, New Delhi, 3rd Edition.	2015
2.	Robert H. Carver &Jane Gradwohl Nash	Doing Data Analysis	Thompson Brooks/Cole	2013
3.	Dr. S .L. Gupta & Hitesh Gupta	SPSS17.0 for Researchers	International Book House Pvt. Ltd- 2nd Edition.	2014

Web links:

1. **https://youtu.be/Bku1p481z80**

2. **https://www.youtube.com/watch?v=_zFBUfZEBWQ**

3. **https://youtu.be/DmS63ivVjis**

4. **https://youtu.be/i8lmUkB4lag**

Pedagogy:

Power point presentation, Group Discussion, Seminar, Assignment.

NON-MAJOR ELECTIVE – II (NME)

MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II

2019-2020 Onwards

Semester - IV	MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II	Hours/Week – 2	
Non-Major Elective-II		Credits – 2	
Course Code – 19UMA4NME2		Internal 25	External 75

Objectives:

- ➢ To provide the knowledge to analyze, interpret and solve the Mathematical problems.
- ➢ To develop the thinking capacity to solve the problems.
- ➢ To study many short tricks to solve the mathematical problems easily

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

CO Number	CO Statement	Knowledge Level
CO1	Solve decimal fractions and simplification.	K2
CO2	Explain the concept of square roots, cube roots, Average, profit .and loss	K2
CO3	Apply the concept of Ratio & Proportion and Problems on Trains.	K3
CO4	Distinguish the concept of Simple Interest and Compound Interest.	K3
CO5	Apply the concept of Permutations &Combinations, Odd Man Out & Series.	K3

Mapping with Programme Outcomes:

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

S - Strong, M - Medium, L - Low

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NON-MAJOR ELECTIVE – II (NME)

MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II

SYLLABUS

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UNIT I (6 Hours)

Decimal Fractions – Simplification

UNIT II (6 Hours)

Square Roots & Cube Roots - Average - Profit & Loss

UNIT III (6 Hours)

Ratio & Proportion **-** Problems on Trains

UNIT IV (6 Hours)

Simple Interest - Compound Interest

UNIT V (6 Hours)

Permutations & Combinations – Odd Man Out & Series

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	R.S.Aggarwal	Quantitative Aptitude	S. Chand & Company Ltd,	2007

CHAPTERS AND SECTIONS:

Unit	Chapter	Pages
I	3 & 4	46 – 116
II	5, 6 & 11	117 - 160 and 251 - 293
III	12 & 18	294 – 310 and 405 - 424
IV	21 & 22	445 – 486
V	30 & 35	613 – 620 and 649 - 657

REFERENCE BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	T.K.Sinha	80+ Practice Sets of Quantitative Aptitude for Bank PO Exams	Arihant Publication (India) limited	2002
2.	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	McGraw-Hill Publishing Company Limited, New Delhi, 5th Edition	2014

Web links:

1. **https://youtu.be/8BeJUzLqOTE**
2. **https://youtu.be/pShzc9AQMos**
3. **https://youtu.be/JP5J-rzoATg**
4. **https://youtu.be/ZnpEoROH1Vc**
5. **https://youtu.be/VIsyYMEAagc**

Pedagogy:

Group Discussion, Seminar, Assignment.

SEMESTER V

CORE COURSE-VIII (CC)
ABSTRACT ALGEBRA
2021-2022 Onwards

Semester - V	ABSTRACT ALGEBRA	Hours/Week – 6	
CORE COURSE-VIII		**Credits – 5**	
Course Code – 21UMA5CC8		**Internal 25**	**External 75**

Objectives:

➢ To prepare students to understand the concepts and properties of algebra and their application.
➢ To provide the principles and practices of algebra.
➢ To Construct a legitimate proof involves different skills and expertise problem solving.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic concept of Abstract Algebra and give examples.	**K2**
CO2	Describe the concept of cyclic subgroups.	**K2**
CO3	Apply properties of normal subgroups and quotient groups, finite groups and Cayley tables.	**K3**
CO4	Compose clear and accurate points using the concept of rings.	**K5**
CO5	Assess the impact of unique factorization domain, Euclidean domain.	**K6**

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

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CORE COURSE-VIII (CC)

ABSTRACT ALGEBRA

SYLLABUS

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UNIT I (18 hours)

Definition of a Group- Some Examples of Groups- Some Preliminary Lemmas-
Subgroups.

UNIT II (18 hours)

 A Counting Principle – Normal Subgroups and Quotient Groups – Homomorphisms.

UNIT III (18 hours)

Automorphisms- Cayley's Theorem - Permutation Groups.

UNIT IV (18 hours)

Definition and Examples of Rings – Some Special Classes of Rings – Homomorphisms
– Ideals and Quotient Rings.

UNIT V (18 hours)

More Ideals and Quotient Rings – The Field of Quotient of an Integral Domain -
Euclidean Rings – A Particular Euclidean Ring.

TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	I.N.Herstein	Topics in Algebra	John Wiley & Sons	2013

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	2	2.1-2.4
II	2	2.5-2.7
III	2	2.8-2.10
IV	3	3.1-3.4
V	3	3.5-3.8

REFERENCE BOOKS:

S.No	Authors Name	Title of the book	Publishers Name	Year of Publication
1.	S.Arumugam & A.Thangapandi Isaac	Modern Algebra	Scitech Publications India (Pvt)Ltd	May 2017
2.	T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapathy	Algebra	S.Viswanathan Pvt Limited, Chennai	2004
3.	Joseph Rotman	Galois Theory, 2nd Edition	Springer Verlag	1990

Web links:

1. https://youtu.be/CJpZJLYKk0I
2. https://youtu.be/mcX0sMnYyMU
3. https://youtu.be/lrQMV4zGF44
4. https://youtu.be/7LtpPI46O0Q
5. https://youtu.be/K1iuXqHFWRw

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

CORE COURSE – IX (CC)
REAL ANALYSIS
2021 – 2022 Onwards

Semester – V		Hours/Week – 5	
Core Course – IX	REAL ANALYSIS	Credits – 5	
Course Code - 21UMA5CC9		Internal 25	External 75

Objectives:

➢ To enable the students to understand the basic concepts of Analysis.

➢ To impart knowledge in concepts of solving various problems regarding field axioms.

➢ To Construct a proof that involves different problem solving ideas and expertise in them.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the fundamental properties of real numbers that lead to the formal development of real analysis.	**K2**
CO2	Understand the concept of limit of a function on the real line R and metric space.	**K2**
CO3	Describe the continuous and discontinuous functions on metric spaces.	**K2**
CO4	Explain the concept of connectedness, completeness and compactness.	**K2**
CO5	Classify the basic concepts of Riemann integration.	**K3**

Mapping with Programme Outcomes:

COs/Pos	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
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

CORE COURSE – IX (CC)
REAL ANALYSIS
SYLLABUS

Unit I (15 Hours)

Sets and functions

Sets and elements – Operations on sets – Functions – Real-valued functions – Equivalence, Countability – Real numbers - Least upper bounds.

Unit II (15 Hours)

Limits and metric spaces

Limits of a function on the real line – Metric spaces – Limits in metric spaces.

Unit III (15 Hours)

Continuous functions on metric spaces

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – Open sets – Closed sets – Discontinuous functions on R^1 – The distance from a point to a set.

Unit IV (15 Hours)

Connectedness, completeness and compactness

More about open sets – Connected sets – Bounded sets and totally bounded sets – Complete metric spaces – Compact metric spaces – Continuous functions on compact metric spaces – continuity of the inverse function – uniform continuity.

Unit V (15 Hours)

Calculus

Sets of measure zero – Definition of the Riemann integral –Existence of the Riemann integral –Properties of the Riemann integral – Derivatives – Rolle's Theorem – The law of the mean - Fundamental theorems of calculus.

TEXT BOOK:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	Richard R. Goldberg	Methods of Real Analysis	Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi	Reprint 2019

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	1	1.1-1.7
II	4	4.1-4.3
III	5	5.1-5.6
IV	6	6.1 -6.8
V	7	7.1-7.8

REFERENCE BOOKS:

S.NO.	AUTHORS	TITLE OF THE BOOK	PUBLISHERS	YEAR OF PUBLICATION
1.	Tom M. Apostol	Mathematical Analysis	Addison-Wesley Publishing Company	Fifth Printing 1981
2.	Robert G. Bartle and Donald R. Sherbert	Introduction to Real Analysis	John Wiley & Sons Private Ltd.,	3rd Edition, 2007
3.	M. K. Singal, Asha Rani Singal	A First Course in Real Analysis	R. Chand & Co	2007

Web links:

1. https://youtu.be/XjiT88Czx5c?t=15
2. https://youtu.be/1diSwLMJpvs?t=626
3. https://youtu.be/YEG18ISnThE?t=4
4. https://youtu.be/4TzGkHFnn7g?t=3
5. https://youtu.be/y5tni8My-VY?t=4

Pedagogy:

Assignment, Seminar, Lecture, Quiz, Group discussion, Brain storming, e-content.

CORE COURSE – X (CC)
STATICS
2021-2022 Onwards

Semester – V		Hours/Week – 5	
Core Course X - (CC)	STATICS	Credits – 4	
Course Code –		Internal	External
21UMA5CC10		25	75

Objectives:

- ➢ To provide the basic knowledge of equilibrium of a particle.
- ➢ To develop a working knowledge to handle practical problems.
- ➢ To understand the procedure for analysis of static objects.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic concepts of force, equilibrium and the resultant of two forces.	K2
CO2	Classify friction and relate limiting equilibrium on a rough inclined plane.	K3
CO3	Compute moment of a force.	K3
CO4	Reduce coplanar force into a couple and a force.	K4
CO5	Ascertain the different aspects of strings and application of common catenary.	K4
CO6	Determine the principle of Virtual Work for applying the system of bodies in equilibrium.	K4

Mapping with Programme Outcome:

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	M	S
CO6	S	S	S	M	S

S-Strong, M-Medium, L-Low

CORE COURSE –X (CC)
STATICS
SYLLABUS

UNIT – I (15 Hours)

(a)Forces:

Newton's laws of motion-Resultant of two forces on a particle.

(b)Equilibrium of a particle:

Equilibrium of a particle –Limiting equilibrium of a particle on an inclined plane.

UNIT –II (15 Hours)

Forces on a rigid body:

Moment of a force – Equivalent systems of forces- Parallel forces – Forces along the sides of a Triangle – Couples.

UNIT –III (15 Hours)

(a)Coplanar Forces:

Resultant of several coplanar forces-Equation of the line of action of the resultant-Equilibrium of a rigid body under three coplanar forces.

(b)A specific Reduction of forces:

Reduction of coplanar forces into a force & a couple – Problems involving frictional forces.

UNIT – IV (15 Hours)

Virtual Work:

Virtual Work- Principle of Virtual Work – applied to a body or a system of bodies in equilibrium –Equation of Virtual Work –Simple Problems.

UNIT – V: **(15 Hours)**

Hanging Strings:

   Strings - Equilibrium of Strings under gravity – Common Catenary – Suspension
bridge.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	P.Duraipandiyan Laxmi Duraipandiyan Muthamizh Jayapragasam	Mechanics	S.Chand & Company Pvt Ltd	2010

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	2 & 3	2.1,2.2 and 3.1,3.2
II	4	4.1-4.6(Omit 4.2)
III	4 &5	4.7-4.9 and 5.1,5.2
IV	8	8.1
V	9	9.1 and 9.2

REFERENCE BOOKS:

S.No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	M.K.Venkataraman	Statics	Agasthiyar Publications	2002
2.	A.V.Dharmapadham	Statics	S. Viswanathan Publishers Pvt Ltd	2006
3.	A.S.Ramsey	Statics	CBS Publishers and Distributors Private Ltd	2004

Web links:

1. https://youtu.be/FdJF_4uZkSQ
2. https://youtu.be/JJX3-af_JQw
3. https://youtu.be/YqtrfQ4H7V8
4. https://youtu.be/QBWk996hg5E
5. https://youtu.be/xP1lpCIe1VM

Pedagogy:

Power point presentations, Group Discussion, Seminar, Quiz , Assignment, Brain storming, E-content, Lecture.

CORE COURSE – XI (CC)

DISCRETE MATHEMATICS

2021-2022 Onwards

Semester – V	DISCRETE MATHEMATICS	Hours/Week – 4	
CORE COURSE – XI (CC)		Credits – 3	
Course Code – 21UMA5CC11		Internal 25	External 75

Objectives:

➢ To make the students understand the basics of discrete mathematics.

➢ Applying the method of logical reasoning to solve a variety of problems.

➢ To introduce the concepts of Lattices and Boolean Algebras.

Course Outcome:

On the Successful completion of the course the student would be able to

CO No.	CO Statement	Knowledge Level
CO1	Illustrate the concepts on statements and truth tables.	K2
CO2	Describe the properties of lattices and some special lattices.	K2
CO3	Apply the ideas of tautology in statements.	K3
CO4	Relate the notion of normal forms and its types.	K3
CO5	Apply the theory of Boolean Algebra and its functions.	K3
CO6	Compute the inference theory of predicate calculus and its characteristics.	K3

Mapping with Programme Outcomes:

COS\POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	M	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	M	S	S	S	S
CO6	S	S	S	S	S

S-Strong, M-Medium, L-Low

CORE COURSE – XI (CC)
DISCRETE MATHEMATICS
SYLLABUS

Unit I   **(12 Hours)**

Statements and Notation – Connectives: Negation – Conjunction – Disjunction – Statement formulas and Truth Tables – Conditional and Biconditional – Well-Formed Formulas– Tautologies – Equivalence of formulas – Duality Law –Tautological Implications – Formulas with Distinct Truth Tables.

Unit II   **(12 Hours)**

Normal Forms : Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms – Ordering and Uniqueness of Normal Forms.

Unit III   **(12 Hours)**

The Predicate Calculus: Predicates – The Statement Function, Variables and Quantifiers– Predicate Formulas – Free and Bound Variables – The Universe of Discourse – Inference Theory of the Predicate Calculus – Valid Formulas and Equivalences – Some Valid Formulas over Finite Universe – Special Valid Formulas Involving Quantifiers – Theory of Inference for the Predicate Calculus – Formulas Involving More Than One Quantifier – Binary and n-ary Operations – Characteristic Function of a Set – Hashing Functions**.**

Unit IV   **(12 Hours)**

Lattices as Partially Ordered Sets : Definition and Examples – Some Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices , Direct Product and Homomorphism – Some Special Lattices.

Unit V   **(12 Hours)**

Boolean Algebra : Definition and Examples – Sub Algebra, Direct Product and Homomorphism – Boolean Functions : Boolean Forms and Free Boolean Algebras – Values of Boolean Expressions and Boolean Functions – Representation and Minimization of Boolean Functions :Representation of Boolean Functions – Minimization of Boolean Functions.

TEXT BOOKS:

S.No	Authors	Title	Publishers	Year of publication
1.	J.P. Tremblay & R. Manohar	Discrete Mathematical Structures with Applications to Computer Science	Tata McGraw Hill	2011

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	1	1-1
	1	1-2.1 to 1-2.4, 1-2.6 to 1-2.12
II	1	1-3.1 to 1-3.5
III	1	1-5.1 to 1-5.5, 1-6.1 to 1-6.5
	2	2-4.4 to 2-4.6
IV	4	4-1.1 to 4-1.5
V	4	4-2.1, 4-2.2, 4-3.1, 4-3.2, 4-4.1, 4-4.2

REFERENCE BOOKS:

S.No	Authors	Title	Publishers	Year of publication
1.	Rakesh Dube, Adesh Pandey and Ritu Gupta	Discrete Structures and Automata Theory	Narosa Publishing House.	2000
2.	John E. Hopcroft Jeffery D. Ullman	Introduction to Automata Theory	Languages and Computation.	1995

Web links :

1. https://youtu.be/i3m0hV157Ro
2. https://youtu.be/5cyocztOtq4
3. https://youtu.be/w9DyAVrU8j0
4. https://youtu.be/qPtGlrb_sXg
5. https://youtu.be/MH2uTVgG1bo

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

MAJOR BASED ELECTIVE COURSE – I (A)
FUZZY SET THEORY AND ITS APPLICATIONS
2021-2022 Onwards

Semester – V	FUZZY SET THEORY AND ITS APPLICATIONS	Hours/Week – 4	
Major Based Elective – I (A)		Credits – 3	
Course Code – 21UMA5MBE1A		Internal 25	External 75

Objectives:

➢ To introduce the concept of fuzzy theory and study its application in real problems.

➢ To acquire knowledge of the uncertainty environment through the fuzzy sets that incorporates imprecision and subjectivity.

➢ To provide a good outline of a model formulation and solution process.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the basic concepts of Fuzzy set theory.	K2
CO2	Classify the operations on Fuzzy sets and Fuzzy measures and give examples.	K3
CO3	Explain the basic concepts of arithmetic fuzzy numbers.	K3
CO4	Compose clear and accurate proofs using the concepts of Fuzzy logic and propositions.	K6
CO5	Develop Fuzzy concepts to design fuzzy control system models.	K6

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

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MAJOR BASED ELECTIVE –I (A)

FUZZY SET THEORY AND ITS APPLICATIONS

SYLLABUS

</div>

UNIT I (12 Hours)

FUZZY SET THEORY:

Fuzzy Sets – Fuzzy Set: Definition – Types of Fuzzy Sets – Characteristics of Fuzzy Sets – Other Important Operations – General Properties : Fuzzy Vs Crisp.

UNIT II (12 Hours)

OPERATIONS ON FUZZY SETS:

Introduction – Some Important Theorems – Extension Principle for Fuzzy Sets – Fuzzy Compliments – Further Operations on Fuzzy Sets – t-Norms and t-Conorms – Definition of Intersection and Union by Hamacher – Yager's Union and Intersection of Two Fuzzy Sets – Union and Intersection of Two Fuzzy Sets as given by Dubois and Prade – Extension Principle for Fuzzy Sets – Aggregation Operations.

UNIT III (12 Hours)

FUZZY NUMBERS AND ARITHMETIC:

Introduction – Fuzzy Numbers – Algebraic Operations with Fuzzy Numbers – Binary Operation of Two Fuzzy Numbers – Some Special Extended Operations – Extended Operations for L-R Representation of Fuzzy Sets – Fuzzy Arithmetic – Arithmetic Operations on Fuzzy Numbers in the Form of α-Cut Sets – Fuzzy Equations – Approximate Methods of Extension – Interval Analysis in Arithmetic – Lattice of Fuzzy Numbers.

UNIT IV   **(12 Hours)**

FUZZY LOGIC:

An Overview of Classical Logic – Connectives – Types of Sentences – Truth Values and Truth Table – Tautology – Algebra of Statements – Validity of Arguments – Logical Identities of Crisp Logic – Well Formed Formulas (WFF) – Predicates and Quantifiers – Quantifiers and Logical Operators – Normal Forms – Fuzzy Logic and Fuzzy Propositions – Fuzzy Connectives– Fuzzy Inference – Fuzzy Propositions – Fuzzy Quantifiers.

UNIT V   **(12 Hours)**

FUZZY SYSTEMS AND FUZZY CONTROL:

Introduction – Fuzzy Rule Based System – Fuzzification and Defuzzification – Fuzzy Control – Assumptions in a Fuzzy Control System Design – Design of Fuzzy Controllers – Fuzzy Control System Models–Fuzzy Neural Network–Fuzzy Automata.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1	Sudhir K. Pundir & Rimple Pundir	Fuzzy Sets and their Applications	A Pragati Edition	2006

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	1	1.16 - 1.21
II	2	2.1 - 2.11
III	3	3.1 - 3.12
IV	7	7.1 - 7.17
V	8	8.1 - 8.7, 8.9, 8.10

REFERENCE BOOKS:

S.No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1	H.J.Zimmermann	Fuzzy Set Theory and its Applications Fourth Edition	Springer(India) Private Limited	2006
2	George J. Klir and Bo Yuan	Fuzzy Sets & Fuzzy Logic Theory and Applications	Prentice-Hall of India	1995
3	Kwang H.Lee	First course on Fuzzy theory and Applications	Springer	2005

Web links:

1. https://youtu.be/HjCTfx2AAaw
2. https://youtu.be/XHNhqCSGV60
3. https://youtu.be/6daiRieEQlU
4. https://youtu.be/N8yhE1GaaQc
5. https://youtu.be/_po4FxxE9c8

Pedagogy:

Power point presentation, Group Discussion, Seminar, Quiz, Assignment.

MAJOR BASED ELECTIVE – I (B)
ASTRONOMY
2021–2022 Onwards

Semester – V		Hours/Week – 4	
Major Based Elective – I (B)	ASTRONOMY	Credits – 3	
Course Code -21UMA5MBE1B		Internal 25	External 75

Objectives:

➢ To introduce the exciting world of astronomy to the students.

➢ To help the students to study spherical trigonometry in the field of astronomy.

➢ To understand the movements of the celestial objects.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the concepts of Celestial sphere, diurnal motion, Celestial coordinates and sidereal time.	K2
CO2	Classify circumpolar stars, zones of earth, perpetual day, dip of horizon and twilight.	K3
CO3	Derive refraction, laws of refraction, tangent formula, Cassini's formula, horizontal refraction, geocentric parallax and horizontal parallax.	K3
CO4	Discuss lunar and solar eclipses and ecliptic limits.	K3
CO5	Ascertain Kepler's laws, verification of 1st and 2nd laws in the case of earth, Anomalies, Kepler's equation, Seasons, causes and kinds of years.	K4

Mapping with Programme Outcomes:

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

S–Strong, M–Medium, L–Low

MAJOR BASED ELECTIVE – I (B)
ASTRONOMY
SYLLABUS

UNIT I   **(12 Hours)**

Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems) – Celestial sphere and diurnal motion – Celestial coordinates – sidereal time.

UNIT II   **(12 Hours)**

Morning and evening stars – circumpolar stars – diagram of the celestial sphere – zones of earth – perpetual day –dip of horizon–twilight.

UNIT III   **(12 Hours)**

Refraction – laws of refraction – tangent formula – Cassini's formula – horizontal refraction – geocentric parallax – horizontal parallax.

UNIT IV   **(12 Hours)**

Kepler's laws – Anomalies – Kepler's equation – Kinds of years.

UNIT V   **(12 Hours)**

Moon–sidereal and synodic months – elongation – phase of moon – eclipses–umbra and penumbra – lunar and solar eclipses – ecliptic limits – maximum and minimum number of eclipses near a node and in a year – Saros of Chaldeans.

TEXT BOOKS:

S. No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	S. Kumaravel and Susheela Kumaravel	Astronomy	SKV Publications	2004

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	ART
I	1	1 – 38
	2	39 – 79
II	2	80–86
	3	87 – 101, 106 – 116
III	4	117–134
	5	135 – 144
IV	6	146–149, 153-165
	7	166–172, 175–189
V	12	229–255
	13	256–275

REFERENCE BOOKS:

S.No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	G.V. Ramachandran	Astronomy	Mission Press, Palayamkottai.	1965

Web links:

1. https://youtu.be/GIMAocKlagM
2. https://youtu.be/qNLAb–Rdcgs
3. https://youtu.be/F6Tkb8syTK8
4. https://youtu.be/re3oEKX6Fks
5. https://youtu.be/ZS2FvljQXsk

Pedagogy:

Power point presentations, Group Discussion, Seminar, Quiz , Assignment, e–content, Lecture.

Semester - V		Hours/Week -4	
Major Based Elective - I (C)	**ARTIFICIAL INTELLIGENCE**	**Credits - 3**	
Course Code - 21UMA5MBE1C		**Internals 25**	**Externals 75**

Objectives

- To understand the basics of Artificial Intelligence
- To enrich the knowledge on various reasoning technique
- To provide the basics of Logic Programming and Prolog

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define the basic principles, models, and algorithms used in Artificial Intelligence.	K1
CO2	Understand knowledge representation	K2
CO3	Describe knowledge on various reasoning techniques	K2
CO4	Apply AI techniques to predict solution to the real world problems	K3
CO5	Explore the concepts of Logic programming and Prolog	K4

Mapping with Programme Outcomes

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

S-Strong;   M-Medium;   L-Low;

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MAJOR BASED ELECTIVE – I (C)
ARTIFICIAL INTELLIGENCE
SYLLABUS

</div>

UNIT I (12 HOURS)

Introducing Artificial Intelligence: Introduction - The Turing Test - Goals of AI - Roots of AI - Artificial Consciousness - Techniques Used in AI - Sub-fields of AI - Perception, Understanding, and Action - Physical Symbol System Hypothesis - Considerations for Knowledge Representation - Knowledge Representation Using Natural Language.

UNIT II (12 HOURS)

Logic and Reasoning Patterns: Introduction – Argumentation Theory - Role of Knowledge - Propositional Logic - Reasoning Patterns- Proof Methods- Non monotonic Reasoning -Hilbert and the Axiomatic Approach

UNIT III (12 HOURS)

First Order Predicate Logic: Introduction - Representation in Predicate Logic - Syntax and Semantics - Conversion to Clausal Form - Substitutions and Unification - Resolution Principle - Complexity of Resolution Proof - Interpretation and Inferences - Most General Unifiers - Unfounded Sets

UNIT IV (12 HOURS)

Rule Based Reasoning: Introduction – An Overview of RBS – Forward Chaining – Backward Chaining – Forward versus Backward Chaining - Typical RB System – Other Systems of Reasoning.

UNIT V (12 HOURS)

Logic Programming and Prolog: Introduction – Logic Programming – Interpretation of Horn clauses in Rule Chaining – Logic Versus Control – Expressing Control Information – Running Simple Programs – Some Bulit-in Predicates – Recursive Programming – List Manipulation – Arithmetic Expression – Backtracking, Cuts and Negation – Efficiency Consideration for Prolog Programs.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	K.R.Chowdhary	Fundamentals of Artificial Intelligence	Springer Nature India Private Limited, New Delhi	2020

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	Sridhar Seshadri	A first course in Artificial Intelligence and Agent Technology	1st Edition, LAP LAMBERT Academic Publishing, India	2017
2.	Wolfgang Ertel	Introduction to Artificial Intelligence	Springer International Publishing G, Germany	2017
3.	Kevin Knight, Elaine Rich, Shivashankar B. Nair	Artificial Intelligence	MC Graw Hill Education, India	2017

Web References

1. https://www.ibm.com/topics/artificial-intelligence

2. https://u-next.com/blogs/artificial-intelligence/logic-programming/

3. https://www.inf.ed.ac.uk/teaching/courses/aipp/

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Demo, Quiz and Seminar.

STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)

2019-2020 Onwards

Semester – V	STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)	Hours/Week – 2	
Skill Based Elective –II(A)		Credits – 2	
Course Code – 19UMA5SBE2AP		Internal 40	External 60

Objectives:

- ➢ To explore and understand how to use the R documentation.
- ➢ To familiar with R interactive environment.
- ➢ To understand how to create and manipulate datas in R.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Navigate in the R Studio interface.	K2
CO2	Apply the Statistical Programming Software.	K2
CO3	Explain concepts related to Statistical datas.	K3
CO4	Explain the terms of constructs, control statements, string functions.	K3
CO5	Compute R programming from a statistical Perspective.	K3

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

SKILL BASED ELECTIVE – II (A)

STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)

SYLLABUS

1. Creating and Displaying data.
2. Matrix Manipulations.
3. Creating and manipulating a List and an Array.
4. Frequency Distribution.
5. Bar diagrams, Bar plots and subdivided Bar plots.
6. Pie diagram, 3D Pie diagram and Histogram.
7. Measures of Central Tendency.
8. Quantiles.
9. Variation of data.
10. Correlation and Regression.

Web links:

1. https://youtu.be/_V8eKsto3Ug
2. https://youtu.be/BvKETZ6kr9Q
3. https://youtu.be/HPJn1CMvtmI
4. https://youtu.be/ANMuuq502rE
5. https://youtu.be/I6FJo8x1wZE

Pedagogy:

Power point presentation, Hands on training.

SKILL BASED ELECTIVE – II (B)

STATISTICAL TOOLS AND TECHNIQUES – SPSS (PRACTICAL)

2019-2020 Onwards

Semester – V	STATISTICAL TOOLS AND TECHNIQUES – SPSS (PRACTICAL)	Hours/Week - 2	
Skill Based Elective – II(B)		**Credits - 2**	
Course Code - 19UMA5SBE2BP		**Internal 40**	**External 60**

Objectives:

- ➢ To analyse scientific data related with social science.
- ➢ To process critical data.
- ➢ To manipulate and decipher survey data.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the built in functions for data manipulation.	**K2**
CO2	Explain the ideas and concepts of various charts and Box plots.	**K2**
CO3	Classify the given data for various tests.	**K2**
CO4	Solve Measures of Central Tendency and Dispersion.	**K3**
CO5	Compute Correlation and Regression.	**K3**

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

SKILL BASED ELECTIVE – II (B)
STATISTICAL TOOLS AND TECHNIQUES - SPSS (PRACTICAL)
SYLLABUS

1. Frequencies: Counts and Percents
2. Measures of Central Tendency
3. Measures of Dispersion
4. Histograms, Bar Charts, Boxplots and Scatter Plots
5. T-test and Chi-square Test
6. Correlation
7. Regression

Web links:

1. https://www.youtube.com/watch?v=Bku1p481z80
2. https://www.youtube.com/watch?v=_zFBUfZEBWQ
3. https://www.youtube.com/watch?v=bapuGcjwiLQ
4. https://www.youtube.com/watch?v=C2Qa5d9ij0Y
5. https://www.youtube.com/watch?v=cNrnSEWKJgg

Pedagogy:

Power Point Presentation, Hands on training.

SKILL BASED ELECTIVE – III (A)

LaTeX (PRACTICAL)

2021-2022 Onwards

Semester – V	LaTeX (PRACTICAL)	Hours/Week – 2	
Skill Based Elective – III (A)		Credits – 2	
Course Code – 21UMA5SBE3AP		Internal 40	External 60

Objectives:

➢ To introduce the basic concepts of LaTeX, a typesetting software.

➢ To get knowledge about creating a bibliographic database.

➢ To write mathematical documents in LaTeX.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Define and use new commands within LaTeX.	K1
CO2	Apply mathematical formulae using LaTeX.	K2
CO3	Create a table using LaTeX.	K3
CO4	Classify various types of formulae, equations, matrix etc. by using LaTeX.	K3
CO5	Prepare a bibliography for a particular document.	K3

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

SKILL BASED ELECTIVE – III (A)
LaTeX (PRACTICAL)
SYLLABUS

1. Create a LaTeX document for the given Mathematical Expression.
2. Create a table in LaTeX document.
3. Construct a LaTeX document using sums, integrals and limits.
4. Construct a differential equation and integral equation.
5. Create a LaTeX document that contains the following: Title – Author's name – Abstract– Introduction – Sections.
6. Create a bibliography in LaTeX document.
7. Create a letter in LaTeX.

Web links:

1. https://www.youtube.com/watch?v=fCzF5gDy60g
2. https://www.youtube.com/watch?v=0ivLZh9xK1Q
3. https://www.youtube.com/watch?v=bCumVPGR4ts
4. https://www.youtube.com/watch?v=kefvRACdXHs
5. https://www.youtube.com/watch?v=8byt3ywt1H8&list=RDCMUCGCHc7LsEYT6_2dQauh2NYw&index=8

Pedagogy:

Power point presentation, Hand on Training.

SKILL BASED ELECTIVE – III (B)

NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)

2021-2022 Onwards

Semester – V	NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)	Hours/Week – 2	
Skill Based Elective – III (B)		Credits – 2	
Course Code – 21UMA5SBE3BP		Internal 40	External 60

Objectives:

➢ To identify different mathematical problems and reformulate them in a way that is appropriate for numerical treatment.
➢ Use functions from the programming language library for efficient calculations and visualisation.
➢ Solve problems systematically and to implement the solution in MATLAB.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the use of fundamental data structures.	K2
CO2	Apply MATLAB effectively to analyze and visualize data.	K3
CO3	Solve scientific and mathematical problems.	K3
CO4	Apply basic functions for numerical integration, differentiation, and curve fitting.	K3
CO5	Compute simple programs in MATLAB	K3

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

SKILL BASED ELECTIVE – III (B)

NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)

SYLLABUS

1. Newton – Raphson method of solving equations.
2. Lagrange's method of interpolation.
3. Trapezoidal rule of integration.
4. Simpson's 1/3 rule of integration.
5. Gauss – Elimination method of solving simultaneous equations.
6. Gauss – Seidal method of solving simultaneous equations.
7. R-K fourth order method of solving differential equations.

Web links:

1. https://www.youtube.com/watch?v=NZfd-EuBYyo
2. https://www.youtube.com/watch?v=PLHC4NKNxys
3. https://in.mathworks.com/videos/introduction-to-matlab-81592.html
4. https://www.youtube.com/watch?v=ajJD0Df5CsY
5. https://www.youtube.com/watch?v=dOg631hdPIc

Pedagogy:

Power point presentation, Hand on Training.

PROFESSIONAL SKILLS

2019 – 2020 Onwards

Semester – V		Hours/Week - 2	
UGC Jeevan Kaushal Life Skills	**Professional Skills**	**Credits – 2**	
Course Code - 19UGPS		**Internal 25**	**External 75**

Course Objective

➢ To prepare students to become viable entrepreneurs or employees with necessary professional skills with sound knowledge of Indian and Tamil Culture and Heritage.

➢ To enhance the comprehensive skills required for a work environment leading them competent and confident.

Course Outcome

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

CO No.	CO Statement	Knowledge Level
CO1	Identify and define professional communication skills and effective interaction.	**K1**
CO2	Examine and reproduce LSRW skills in professional development.	**K2**
CO3	Explain and express views and opinions in an assertive manner.	**K2**
CO4	Prepare and practise to be aware of the cultural heritage of India.	**K3**
CO5	Employ and transfer the acquired skills in a practical approach	**K3**

Mapping with Programme Outcomes

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

S – Strong; M – Medium; L – Low

Syllabus

Unit – I   Resume Skills   **(5 Hours)**

- Preparation and Presentation.
- Avoiding Common Errors.
- Preparing Resumes for Specific Purposes.

Unit – II   Interview Skills   **(8 Hours)**

- Useful Vocabulary
- Preparation and Presentation.
- Dos and Don'ts
- Observation of a Simulated Interview.

Unit – III   Body Language and Personal Grooming   (5 Hours)

- Importance of Body Language (Postures, Eye Contact, Expressions & Etiquettes)
- Good Grooming is Being Clean

Unit – IV   Social and Cultural Etiquettes   (6 Hours)

EXISTING TRADITIONAL TAMIL AND INDIAN CULTURE

- Introduction to Tamil Culture
- Introduction to Indian Culture and Etiquette

    Pls. Note:(Subjected to inclusions based on the requirements of the respective disciplines)

- Good Manners and Etiquettes
- Table Manners
- Manners in Public

Unit – V   Group Discussion Skills   (6 Hours)

- Meaning and Methods of Group Discussion.
- Procedure of Group Discussion.
- Group discussion – Simulation.
- Common Errors – How to Avoid It

Material for Teaching and Reference:

https://graphicdesign.sfcc.spokane.edu/dZine/projects/Q3-typographic_resume/resume_basics.pdf

http://worldwideuniversity.org/library/bookboon/the-art-of-interview-skills.pdf

https://www.tutorialspoint.com/positive_body_language/positive_body_language_tutorial.pdf http://egyankosh.ac.in/bitstream/123456789/35846/5/Unit-10.pdf https://www.etiquettescholar.com/dining_etiquette/table_manners.html

http://languagemanuals.weebly.com/uploads/4/8/5/3/4853169/final_tamil_manual.pdf

Pedagogy

Seminar, Simulation, Quiz & Assignment

Course Designer

Dr. Rita Shanthakumar, Associate Professor & Dr. A. Suganthi, Assistant Professor, Department of English.

SEMESTER VI

Core Course – XII (CC)

LINEAR ALGEBRA

2021-2022 Onwards

Semester - VI		Hours/Week –5	
Core Course – XII (CC)	**LINEAR ALGEBRA**	**Credit – 5**	
Course Code – 21UMA6CC12		**Internal** **25**	**External** **75**

Objectives:

➢ To facilitate a better understanding of vector space.

➢ To analyse problems in linear algebra.

➢ To solve problems in matrices.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Explain the ideas of Vector Spaces, Linear Independence and Bases.	**K3**
CO2	Distinguish the concepts of Roots of a Polynomial and the Algebra of Linear Transformations.	**K3**
CO3	Explain the concepts of matrix and Elementary transformation.	**K3**
CO4	Compute Characteristic Equation of a matrix and its inverse by Cayley Hamilton theorem.	**K3**
CO5	Solve the problems related to Eigen Values and Eigen Vectors	**K3**
CO6	Describe Inner Product Space and Modules.	**K3**

Mapping with Programme Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	M	M	S	S	S
CO4	M	M	S	S	S
CO5	S	S	S	S	S
CO6	M	S	M	M	S

S-Strong, M-Medium, L-Low

Core Course – XII (CC)
LINEAR ALGEBRA
2021-2022 Onwards

Unit I   **(15 Hours)**

Elementary Basic Concepts – Linear Independence and Bases – Dual Spaces.

Unit II   **(15 Hours)**

Roots of polynomials – Construction with Straight edge and Compass - More about Roots. **-** The Algebra of Linear Transformations – Characteristic Roots.

Unit III   **(15 Hours)**

Algebra of Matrices – Types of Matrices – The Inverse of a Matrix – Elementary Transformations – Rank of a matrix.

Unit IV   **(15 Hours)**

Characteristic Equation and Cayley – Hamilton theorem – Eigen Values and Eigen Vectors.

Unit V   **(15 Hours)**

Inner Product Spaces: Norm – Orthogonal – Orthogonal Complement – Subspace – Gram Schmidt orthogonalization process – Modules.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	I.N.Herstein	Topics in Algebra	John Wiley & Sons	2013
2.	Arumugam S and Thangapandi Issac A	Modern Algebra	Scitech Publications (India) Private Limited, Chennai.	2012

CHAPTERS AND SECTIONS:

Unit	Chapter	Sections
I	4[1]	4.1 – 4.3
II	5[1]	5.3 – 5.5
	6[1]	6.1 & 6.2
III	7[2]	7.0 -7.5
IV	7[2]	7.7 & 7.8
V	4[1]	4.4 & 4.5

REFERENCE BOOKS:

S.No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	P. B. Bhattacharya, S. K. Jain and S. R. Nagpaul	First Course in Linear Algebra	Wiley Easterrn Limited	1985
2.	Kenneth Hoffman and Ray Kunze	Linear Algebra	PHI Learning Private Limited	2009
3.	K. S. Narayanan and T. K. Manicavachagom Pillay	Modern Algebra, Volume I	S. Viswanathan Private Limited	1982

Web links:

1. **https://youtu.be/1XIT3Y2oyAU**

2. **https://youtu.be/Pc2dWW3aSrk**

3. **https://youtu.be/ERfbtPBEYVA**

4. **https://youtu.be/6NFIsQ7APY**

5. **https://youtu.be/fdsgsMP9JnA**

Pedagogy:

Power point presentations, Group Discussion, Seminar, Quiz, Assignment, Lecture.

CORE COURSE–XIII(CC)

COMPLEX ANALYSIS

2021-2022 Onwards

Semester – VI		Hours/Week – 6	
Core Course –XIII (CC)	**COMPLEX ANALYSIS**	Credit – 5	
Course Code – 21UMA6CC13		**Internal** **25**	**External** **75**

Objectives:

- ➢ Identify curves and region in the complex plane defined by simple expressions.
- ➢ To study about the concepts of Complex Variables and Complex Integration
- ➢ To know about the concept of Power Series Expansion, Singularities and Residues.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the functions of Complex variables, continuity and differentiation of complex variable functions, C – R equations of analytic functions.	**K2**
CO2	Explain about Elementary transformations in Complex variables.	**K2**
CO3	Compute Complex Integration through Cauchy's theorem.	**K3**
CO4	Determine the Power series expansions for Taylor's and Laurent's series.	**K4**
CO5	Diagnose the singularity concept and residues, solving definite integrals using residues.	**K4**

Mapping with Programme Outcomes:

COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	S	M
C03	S	S	S	S	M
C04	S	S	S	M	M
CO5	S	S	S	M	M

S-Strong , M-Medium , L-Low.

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CORE COURSE –XIII (CC)
COMPLEX ANALYSIS
2021-2022 Onwards

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UNIT I

Analytical Functions: (18 Hours)

Functions of a Complex Variable – Limits– Theorems on Limits- Limits Involving the Point at Infinity – Continuity – Derivatives – Cauchy-Riemann Equations – Sufficient Conditions for Differentiability – Polar- Coordinates - Analytic Functions – Examples - Harmonic functions.

UNIT II (18 Hours)

Integrals:

Definite Integrals of Functions $w(t)$ – Contours – Cauchy- Goursat Theorem – Proof of the Theorem – Simply Connected Domains – Multiply Connected Domain – Cauchy Integral Formula – An Extension of the Cauchy Integral Formula – Some Consequences of the Extension – Liouville's Theorem and the Fundamental Theorem of Algebra – Maximum Modulus Principle.

UNIT III (18 Hours)

Series:

Convergence of Sequences – Convergence of Series – Taylor's Series – Proof of Taylor's Theorem – Examples – Laurent Series – Proof of Laurent's Theorem – Examples.

Mapping by Elementary Functions :

Linear Transformations – The Transformation $w = 1/z$ – Mappings by $1/z$ – Linear Fractional Transformations – An Implicit Form – Mappings of the Upper Half Plane –The Transformation $w = Sin\ z$ – Mappings by z^2 and Branches of $z^{1/2}$.

UNIT IV (18 Hours)

Residues and Poles:

Isolated Singular Points – Residues – Cauchy's Residue Theorem – Residue at infinity – The Three Types of Isolated Singular Points – Residues at Poles – Examples – Zeros of Analytic Functions – Zeros and Poles – Behaviour of Functions Near Isolated Singular Points.

UNIT V (18 Hours)

Applications of Residues:

Evaluation of Improper Integrals – Example – Improper Integrals from Fourier Analysis – Jordan's Lemma – Indented Paths – An Indentation Around a Branch Point – Integration Along a Branch Cut – Definite Integrals Involving Sines and Cosines – Argument Principle – Rouche's Theorem.

TEXT BOOKS:

S.No.	Authors	Title of the Book	Publishers Name	Year of Publication
1.	James Ward Brown and Ruel V.Churchill	Complex Variables and Applications	McGraw Hill Higher Education. Eighth Edition, New York.	2009

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS	PAGE NUMBER
I	2	12, 15 - 19, 21 - 26	35-38, 45-59, 63-82
II	4	38,39, 46 - 54	119 – 126, 150 - 175
III	5 and 8	55 – 62, 90 - 97	181 – 208, 311 - 336
IV	6	68 – 77	229 - 260
V	7	78 – 87	261 - 298

REFERENCE BOOKS:

S.No	Authors	Title of the Book	Publishers Name	Year of Publication
1.	S.Arumugam, A.Thangapandi Isaac & A.Somasundaram	Complex Analysis	New Scitech Publications (India) Pvt Ltd.	2005
2.	T.K.Manickavachagam Pillai	Complex Analysis	S.Viswanathan Publishers Pvt Ltd, Chennai.	1994
3.	Duraipandian. P, KayalalPachaiyappa	Complex Analysis	S. Chand & company Pvt. Ltd, 1st Edition, New Delhi.	2014

Web links:

1. https://www.youtube.com/watch?v=b5VUnapu-qs.
2. https://www.youtube.com/watch?v=2v95JHiapxU.
3. https://www.youtube.com/watch?v=WBvRL-QCEN8.
4. https://www.youtube.com/watch?v=qjpLIlVo_6E.
5. https://www.youtube.com/watch?v=o77UV7YrWvw.

Pedagogy:

Power Point Presentation, Group Discussion, Seminar, Assignment.

CORE COURSE – XIV (CC)
DYNAMICS
2021-2022 Onwards

Semester – VI		Hours/Week – 5	
Core Course - XIV (CC)	DYNAMICS	Credits – 5	
Course Code – 21UMA6CC14		Internal 25	External 75

Objectives:

➢ To analyze the bodies in motion using the basics of kinematics.
➢ To provide the basic knowledge of equilibrium of a particle.
➢ To develop a working knowledge to handle practical problems.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the motion under the action of central force.	K2
CO2	Compute motion of a straight line using relative velocity and acceleration.	K3
CO3	Apply the concepts of impulsive forces and impact of spheres.	K3
CO4	Ascertain the various aspect of projectile.	K4
CO5	Examine simple harmonic motions and its characteristics.	K4
CO6	Determine differential equation and pedal equation of a central orbit.	K4

Mapping with Programme Outcomes:

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	M	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	M	S
CO6	S	S	S	S	S

S-Strong, M-Medium, L-Low

CORE COURSE – XIV (CC)
DYNAMICS
SYLLABUS

UNIT I   **(15 Hours)**
Kinematics:
 Basic units – Velocity – Acceleration – Coplanar Motion.

UNIT II   **(15 Hours)**
Projectile:
 Forces on a Projectile – Projectile projected on an inclined plane – Enveloping parabola or bounding parabola.

UNIT III   **(15 Hours)**
Impact:
 Impulsive force – Impact of sphere – Impact of two smooth spheres – Impact of a smooth sphere on a plane – Oblique Impact of two smooth spheres.

UNIT IV   **(15 Hours)**
Rectilinear motion under varying forces:
 Simple harmonic motion – S.H.M. along a horizontal line – S.H.M. along a vertical line.

UNIT V   **(15 Hours)**
Central Orbits:
 General Orbits – Central Orbit – Conic as a centred orbit.

TEXT BOOKS:

S.No	Authors Name	Title Of The Book	Publishers Name	Year Of Publication
1.	P. Duraipandian, Laxmi Duraipandian and Muthamizh Jayapragasam	Mechanics	S.Chand & Company Pvt Ltd	2014

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	1	1.1-1.4
II	13	13.1-13.3
III	14	14.1-14.5
IV	12	12.1-12.3
V	16	16.1-16.3

REFERENCE BOOKS:

S.No	Authors Name	Title Of The Book	Publishers Name	Year Of Publication
1.	M.K.Venkataraman	Dynamics	Agasthiyar Publications	2009
2.	A.V.Dharmapadham	Dynamics	S. Viswanathan Publishers Pvt Ltd	2006
3.	Narayanan S	A Text book of Dynamics	S. Chand and Company	1986

Web links:
1. https://youtu.be/40RU9lWdfTA
2. https://youtu.be/qk7KV0llKrM
3. https://youtu.be/4HZtV_PGHo0
4. https://youtu.be/uM2HpLBVAkA
5. https://youtu.be/MlNmlY_yoZ0
6. https://youtu.be/NsNUuSxaa2Y

Pedagogy:

Power point presentations, Group Discussion, Seminar, Quiz , Assignment, , Brain storming, e-content, Lecture.

CORE COURSE – XV (CC)

OPERATIONS RESEARCH
2021-2022 Onwards

Semester - VI CORE COURSE - XV Course Code - 21UMA6CC15	OPERATIONS RESEARCH	Hours/Week – 5	
		Credits – 4	
		Internal 25	External 75

Objectives:

➢ To impart knowledge in concepts and tools of operations research.

➢ To equip the students with mathematical methods formatted for their major concepts..

➢ To apply these techniques constructively to make effective business making.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the Game theory problems	K2
CO2	Illustrate the Network Problems.	K2
CO3	Describe the Inventory Models.	K2
CO4	Solve the given LPP under various methods.	K3
CO5	Compute solutions to Transportation and Assignment Problem.	K3

Mapping with Programme Outcomes

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

S-Strong, M-Medium, L-Low

OPERATIONS RESEARCH
SYLLABUS

UNIT I (15 Hours)

Linear Programming Problem:

Introduction – Linear Programming Problem – Mathematical formulation of the problem– Illustrations on Mathematical formulation of Linear Programming Problems.

Linear Programming Problem-Graphical solution and Extension:

Introduction – Graphical Solution Method – Some Exceptional Cases – General Linear Programming Problem – Canonical and Standard Forms of Linear Programming Problem.

Linear Programming Problem-Simplex Method:

Introduction – The Computational Procedure

UNIT II (15 Hours)

Linear Programming Problem - Simplex Method:

Use of Artificial Variables

Duality in Linear Programming:

Introduction – General Primal - Dual Pair –Formulating a Dual Problem – Dual Simplex Method.

UNIT III (15 Hours)

Transportation Problem :

Introduction– LP formulation of the Transportation Problem – Existence of Solution in T.P - Solution of a Transportation Problem – Finding an initial basic feasible solution –Test for optimality-Economic Interpretation of u_j's and v_j's- Degeneracy in Transportation Problem-Transportation Algorithm (MODI Method).

Assignment problem:

Introduction – Mathematical Formulation of the Problem – Solution Methods of Assignment Problem –Special cases in Assignment Problems – The Travelling Salesmen problem.

UNIT IV (15 Hours)

Games and Strategies:

Introduction- Two Person Zero sum Games –Some Basic Terms– The Maximin - Minimax Principle –Games without Saddle Points – Mixed Strategies – Graphical Solution of 2 x n and m x 2 games.

Inventory control:

Introduction – Types of Inventories – Reasons for carrying inventories– The inventory Decisions– Objectives of scientific inventory control– Cost associated with inventories– Factors affecting inventory control– An inventory control problem– the concept of EOQ-Deterministic Inventory Problems with no Shortages – Deterministic Inventory Problems with Shortages.

UNIT V (15 Hours)

Network Scheduling by PERT/CPM:

Introduction– Network : Basic components – Logical Sequencing – Rules of Network Construction – Concurrent activities– Critical Path analysis–Probability Considerations in PERT-Distinction between PERT and CPM.

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS
1.	Kanti Swaroop, Gupta.P.K,& Manmohan	Operations Research	Sultan Chand & Sons, 2014

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	2	2.1-2.4
	3	3.1-3.5
	4	4.1, 4.3
II	4	4.4
	5	5.1-5.3,5.9
III	10	10.1-10.3,10.8-10.13
	11	11.1-11.4, 11.7
IV	17	17.1-17.6
	19	19.1-19.11
V	25	25.1-25.8

REFERENCE BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Hamdy A. Taha	Operations Research, An Introduction	Prentice Hall of India	2002
2.	Richard Bronson	Theory and Problems of Operations Research	Tata McGraw Hill Publishing Company	2001
3	S Kalavathy	Operations Research	Vikas apublishing House Private Limited	2013

Web links:

1. https://youtu.be/ItOuvM2KmD4

2. https://youtu.be/SZdKDeubMg8

3. https://www.youtube.com/watch?v=vKVkOpNDZ2s

4. https://youtu.be/M8POtpPtQZc

5. https://youtu.be/8IRrgDoV8Eo

Pedagogy:

 Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

MAJOR BASED ELECTIVE – II (A)
GRAPH THEORY
2021-2022 Onwards

Semester – VI	GRAPH THEORY	Hours/Week – 4	
Major Based Elective – II (A)		Credits – 3	
Course Code – 21UMA6MBE2A		Internal 25	External 75

Objectives:

➢ To understand the fundamental concepts in graph theory.
➢ To introduce the notion of graph theory and its applications.
➢ To learn the techniques of Combinatorics in graph theory.

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Define basic definitions of graphs	K1
CO2	Explain the notion of Eulerian Graphs.	K2
CO3	Describe the concepts of Hamiltonian Graphs and Characterization of Trees.	K2
CO4	Compute the properties of Planar Graphs.	K3
CO5	Apply the concepts of Directed Graphs for solving Kruskal's and Dijkstra's Algorithms.	K3

Mapping with Programme Outcomes:

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

S – Strong, M – Medium, L – Low.

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MAJOR BASED ELECTIVE – II (A)
GRAPH THEORY
SYLLABUS

</div>

UNIT I (12 Hours)

Introduction:

    Introduction - The Konigsberg Bridge Problem.

Graphs and Subgraphs:

    Introduction-Definition and Examples - Degrees - Subgraphs - Isomorphism - Independent Sets and Coverings.

UNIT II (12 Hours)

Graphs and Subgraphs:

    Matrices - Operations on Graphs.

Connectedness:

    Introduction-Walks, Trails and Paths – Connectedness and Components.

Eulerian and Hamiltonian Graphs:

    Introduction- Eulerian Graphs.

UNIT III (12 Hours)

Eulerian and Hamiltonian Graphs:

    Hamiltonian Graphs (Omit Chavatal Theorem).

Trees:

    Introduction-Characterization of Trees - Centre of a Tree.

UNIT IV (12 Hours)

Planarity:

    Introduction - Definition and Properties - Characterization of Planar Graphs.

UNIT V (12 Hours)

Directed Graphs:

    Introduction - Definitions and Basic Properties.

Some Applications:

    Introduction -Connector Problem - Shortest Path Problem.

TEXT BOOKS:

S.No.	Authors Name	Title Of The Book	Publishers Name	Year Of Publication
1.	S. Arumugam & S. Ramachandran	Invitation to Graph Theory	SciTech Publications (India) Pvt. Ltd, Chennai.	2006

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	1	1.0, 1.1
	2	2.0 – 2.4, 2.6
II	2	2.8, 2.9
	4	4.0, 4.1, 4.2
	5	5.0, 5.1
III	5	5.2
	6	6.0 – 6.2
IV	8	8.0 – 8.2
V	10	10.0, 10.1
	11	11.0 – 11.2

REFERENCE BOOKS:

S.No.	Authors Name	Title Of The Book	Publishers Name	Year Of Publication
1.	Narsingh Deo	Graph Theory with applications to Engineering and Computer Science	Prentice Hall of India	2004
2.	Gary Chartrand and Ping Zhang	Introduction to Graph Theory	Tata McGraw-Hill Edition	2004
3.	S. Arumugam and S. Ramachandran	Introduction to Graph Theory	SciTech Publications (India)Pvt., Ltd.,	2006

Web links:

1. https://youtu.be/AtDgXyluW-Y
2. https://youtu.be/gxL6kCc9yS4
3. https://youtu.be/ONdaQOJK574
4. https://youtu.be/mm9YUqZTsNE
5. https://youtu.be/wnYtITkWAYA
6. https://youtu.be/amaH38_mXK4

Pedagogy:

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

MATHEMATICAL MODELLING

2021-2022 Onwards

Semester - VI		Hrs/Week - 4	
MAJOR BASED ELECTIVE-II (B)	**MATHEMATICAL MODELLING**	**Credits - 3**	
Course Code - 21UMA6MBE2B		**Internals** 25	**Externals** 75

Objectives:

➢ **Analyze** the different mathematical models through Ordinary differential equation of first and second order.

➢ **Understand** the implementation of graph theoretical models.
➢ **Depict** the concepts of real world problems.

Course Outcomes:

CO Number	CO Statement On the successful completion of the course, students will be able to	Knowledge Level
CO1	Understand the basics of mathematical model and its process	**K 1**
CO2	Explain the different classifications of mathematical models	**K 2**
CO3	Predict the essential features and discuss the benefits of using a mathematical model	**K 3**
CO4	Examine the applications of mathematical modelling to solve problems in Engineering, Physics, Biological and Social sciences	**K 4**
CO5	Associate and interpret the results to real world problems.	**K4**

Mapping with Programme Outcomes:

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

S – Strong,   M – Medium,   L – Low

MATHEMATICAL MODELLING

SYLLABUS

UNIT I   **(12 hours)**

Mathematical Modelling: Need, Techniques, Classification and Simple Illustrations

        The Technique of Mathematical Modelling – Classification of Mathematical Models – Some Characteristics of Mathematical Models – Mathematical Modelling through Geometry – Mathematical Modelling through Algebra – Mathematical Modelling through Trigonometry.

UNIT II   **(12 hours)**

Mathematical Modelling through Ordinary Differential Equations of First order

        Mathematical Modelling through Differential Equations – Linear growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Mathematical Modelling in Dynamics through Ordinary Differential Equations of First Order.

UNIT III   **(12 hours)**

Mathematical Modelling through Systems of Ordinary Differential Equations of the First Order

        Mathematical Modelling in Population Dynamics – Mathematical Modelling of Epidemics through Systems of Ordinary Differential Equations of First Order – Compartment Models through Systems of Ordinary Differential Equations – Mathematical Modelling in Economics through Systems of Ordinary Differential Equations – Mathematical Models in Medicine, Arms Race, Battles and International Trade in terms of Systems of Ordinary Differential Equation

UNIT IV   **(12 hours)**

Mathematical Modelling through Ordinary Differential Equations of Second Order

        Mathematical Modelling of Planetary Motions – Mathematical Modelling of Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order.

UNIT V   **(12 hours)**

Mathematical Modelling through Graphs

        Situations that can be Modelled through Graphs – Mathematical Models in terms of Directed Graphs – Mathematical Models in terms of Signed Graphs –Mathematical Modelling in terms of Weighted Digraphs.

TEXT BOOKS:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	J. N. Kapur	Mathematical Modelling	New age international(P) Limited	2001

CHAPTERS AND SECTIONS:

UNIT	CHAPTERS	SECTIONS
I	1	1.2 – 1.7
II	2	2.1 – 2.5
III	3	3.1 – 3.5
IV	4	4.1 – 4.3
V	7	7.1 – 7.4

Reference Books:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	Bimal K.Mishra & Dipak K.Satpathi	Mathematical Modeling Applications, Issues and Analysis	Ane Books Pvt. Ltd	2021
2.	Edward A. Bender	An Introduction to Mathematical Modelling	Dover Publications	2019
3.	Rutherford Aris	Mathematical Modelling Techniques	Dover Publications	2022
4.	Clive L.Dym	Principles of Mathematical Modelling	Academic Press	2006

Web links:

1. **https://youtu.be/df5EK1P6Ph0?t=375**

2. **https://youtu.be/df5EK1P6Ph0?t=5**

3. **https://youtu.be/hGJUFUfu9mA**

4. **https://youtu.be/Z_u6jSgCH-0?t=104**

5. **https://youtu.be/FBvky0jAdmA?t=774**

6. **https://www.mas.ncl.ac.uk/~nyt27/1400/doc/notes1400.pdf**

7. **http://www.math.ntu.edu.tw/~chern/notes/ode2015.pdf**

Pedagogy:

Power point presentation, Group discussion, Seminar, Assignment.

MAJOR BASED ELECTIVE – II (C)

FUNDAMENTALS OF BIG DATA ANALYTICS
2021-2022 Onwards

Semester – VI	FUNDAMENTALS OF BIG DATA ANALYTICS	Hours/Week -4	
Major Based Elective – II (C)		Credits - 3	
Course Code - 21UMA6MBE2C		Internals 25	Externals 75

Objectives:

- **Inculcate** a strong foundation on basic concepts of Big Data.
- **Understand** the components of Hadoop framework and MapReduce
- **Explore** Big Data analytics tools.

Course Outcomes:

CO Number	CO Statement On the successful completion of the course, the students will be able to,	Knowledge Level
CO1	Understand the Big Data phenomenon.	K2
CO2	Explain the various Big Data tools.	K2
CO3	Classify the use of predictive analytics on big data.	K2
CO4	Identify the potential use of Big Data in corporate environment.	K4
CO5	Analyze large scale data.	K4

Mapping with Programme Outcomes:

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

S-Strong;   M-Medium;   L-Low;

MAJOR BASED ELECTIVE – II (C)
FUNDAMENTALS OF BIG DATA ANALYTICS
SYLLABUS

UNIT I   **(12 HOURS)**

OVERVIEW OF BIG DATA:

Defining Big data - Big data Types-Analytics-Industry Examples of Big data and Data Risk- Big data Technologies- The Benefits of Big data.

UNIT II   **(12 HOURS)**

BASICS OF HADOOP:

Big data and Hadoop- Hadoop Architecture- Main components of Hadoop Framework- Analyzing Big data with Hadoop-Distributed Application concept- Hadoop Distributed File system-Advantages of Hadoop- Ten Big Hadoop Platforms.

UNIT III   **(12 HOURS)**

NO SQL DATA MANAGEMENT AND MONGODB:

No SQL Data Management- Types of No SQL Databases- Choosing a query model for Bigdata- Benefits of NoSQL- MongoDB- Advantages of MongoDB over RDBMS.

UNIT IV   **(12 HOURS)**

HBASE AND CASSANDRA, MAPREDUCE:

Introduction to HBASE- HBASE Architecture- HBASE data model- Cassandra: Introduction- Features of Cassandra- data replication in Cassandra – Components of Cassandra- MapReduce: Introduction to Map Reduce – How MapReduce works – Map operations.

UNIT V   **(12 HOURS)**

DATA STREAM MINING:

Data Stream mining- the Stream Data Model- Stream Applications-Data models and query language for streams- Continuous query processing and optimization- Distributed query processing- Data Stream v/s conventional stored relation model.

Text book:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	V.K. JAIN	BIG DATA AND HADOOP	KHANNA BOOK PUBLISHING CO.(P) LTD	2017

CHAPTERS AND SECTIONS:

UNIT	CHAPTERS	SECTIONS
I	1	1.2,1.4-1.7,1.10,1.16
II	2	2.1-2.6,2.16,2.20
III	5	5.1-5.6,5.10
IV	6	6.1,6.4,6.5,6.8,6.9,6.11,6.12
	7	7.1-7.3
V	14	14.1-14.7

Reference Books:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	Bart Baesens	Analytics in a Big Data world	Wiley Big Data Series	2014
2.	Thomas Erl Wajid Khattak and Paul Buhler	Big Data Fundamentals: Concepts, Drivers & Techniques	Pearson	2016
3.	Raj Kamal and Preeti Saxena	Big data Analytics	McGraw Hill Education Private Ltd.,	2019

Weblinks:

1. **https://youtu.be/LkEQQwVsET8**

2. **https://appinventiv.com/blog/hbase-vs-cassandra/#:~:text=HBase%20has%20a%20master%2Dbased,once%20the%20master%20is%20down.**

3. **https://hevodata.com/learn/data-streams-in-data-mining/**

4. **https://youtu.be/aReuLtY0YMI**

5. **https://youtu.be/nJRrNb4ZaUM**

6. **https://youtu.be/DrLJwSci6b8**

7. **https://youtu.be/JZGtV278SvE**

Pedagogy:

Chalk and Talk, PPT, Discussion, Assignment, Quiz and Seminar.

MAJOR BASED ELECTIVE – III (A)
PROBABILITY AND QUEUEING THEORY
(2021-2022 Onwards)

Semester - VI	PROBABILITY AND QUEUEING THEORY	Hours/Week -4	
Major Based Elective - III (A)		Credits – 3	
Course Code - 21UMA6MBE3A		Internals 25	Externals 75

Objectives:

- **Understand** the various features of Probability.

- **Analyze** the solutions using Probability.

- **Explore** the concepts of Queueing Theory in real life problems**.**

Course Outcomes:

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts of Probability and Acquire Knowledge of Standard distribution which can describe real life phenomena.	K1
CO2	Identify various distribution functions and acquire skills in handling situations involving more than one variable	K2
CO3	Apply the basic characteristics features of a queueing system and acquire skills in analyzing queueing models	K3
CO4	Analyze the various Classifications of Random Processes and Characterized phenomena which evolve with respect to time in Probabilistic manner	K4
CO5	Deduce the different queueing models and its applications	K5

Mapping with Programme Outcomes:

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

S-Strong; M-Medium; L-Low;

MAJOR BASED ELECTIVE – III (A)
PROBABILITY AND QUEUEING THEORY
SYLLABUS

UNIT I

Random Variables: **(12 HOURS)**

Discrete Random variable – Probability Function – Continuous Random variable – Probability Density Function – Cumulative Distribution Function (cdf) – Properties of the cdf $F(x)$ – Special Distributions – Discrete Distributions – Continuous Distributions – Two – Dimensional Random Variables – Probability Function of (X, Y) - Joint Probability Density function– Cumulative Distribution Function – Properties of $F(x,y)$ – Marginal Probability Distribution – Conditional Probability Distribution

UNIT II   **(12 HOURS)**

Some Special Probability Distributions:

Introduction – Special Discrete Distributions – Mean and Variance of the Binomial Distribution – Recurrence formula for the Central Moments of the Binomial Distribution – Poisson Distribution as limiting form of Binomial Distribution - Mean and Variance of Poisson Distribution - Recurrence formula for the Central Moments of the Poisson Distribution - Mean and Variance of Geometric Distribution – Special Continuous Distributions – Moments of the Uniform Distribution $U(a,b)$- Mean and Variance of the Exponential Distribution – Memoryless Property of the Exponential Distribution - Mean and Variance of Erlang Distribution.

UNIT III   **(12 HOURS)**

Special Random Processes:

Poisson Process – Probability Law for the Poisson Process $\{X(t)\}$ – Second-Order Probability Function of a Homogenous Poisson Process – Mean and Autocorrelation of the Poisson Process – Properties of Poisson Process – Markov Process – Definition of a Markov Chain - Chapman- kolmogorov Theorem – Classification of States of a Markov Chain – Probability Distribution of $X(t)$.

UNIT IV   **(12 HOURS)**

Special Random Processes:

Mean and Variance of the Population Size in a Linear Birth and Death Process – Pure Birth Process – Queueing Processes – Renewal Process – Probablity Distribution of the Number of Renewals, $N(t)$ and $E\{N(t)\}$ – Renewal Equation – Poisson Process as a Renewal Process.

UNIT V   **(12 HOURS)**

Queueing Theory:

Symbolic Representation of Queueing Model – Difference Equations Related to Piosson Queue Systems – Values of P_o and P_n for Poisson Queue Systems – Characteristics of Infinite Capacity, Single Server Poisson Queue Model I $[(M/M/1):(\infty/FIFO)$ Model], when $\lambda_n = \lambda$ and $\mu_n = \mu(\lambda < \mu)$ - Relations Among $E(N_s)$, $E(N_q)$, $E(W_s)$ and $E(W_q)$ – Characteristics of Infinite Capacity, Multiple Server Poisson Queue Model II $[(M/M/S):(\infty/FIFO)$ Model], when $\lambda_n = \lambda$ for all $n(\lambda < s\mu)$- Characteristics of Finite Capacity, Single Server Poisson Queue Model III $[(M/M/1):(k/FIFO)$ Model] - Characteristics of Finite Queue, Multiple Server Poisson Queue Model IV $[M/M/S):(k/FIFO)$ Model].

Text book:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	T. Veerarajan	Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks	Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi.	2010

CHAPTERS AND SECTIONS:

UNIT	CHAPTERS	SECTIONS
I	2	Page No. 2.1 - 2.5, 2.23 - 2.26
II	5	Page No. 5.1 - 5.4, 5.6, 5.8, 5.14, 5.36 - 5.40
III	7	Page No. 7.33 - 7.38, 7.45 - 7.50
IV	7	Page No. 7.54 - 7.68
V	8	Page No. 8.3 - 8.5, 8.10, 8.15, 8.18

Reference Books:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	V. Sudarapandian	Probability, Statistics and Queueing theory	PHI Learning Private Limited, Delhi.	2013
2.	A. Singaravelu, C. Vijayalakshmi	Probability and Queueing theory	Meenakshi Agency, Chennai.	2003
3.	P. Kandasamy K. Thilagavathi K. Gunavathi	Probability, Statistics and Queueing theory	S. Chand & company LTD. Ram Nagar, New Delhi.	2007

Weblinks:

1 **https://youtu.be/m_BspKtRTJs?si=zxPyEOd6T-Ua_7Z2**

2 **https://youtu.be/xGkpXk-AnWU?si=ZZuMUnhhO5d7aTrI**

3 **https://youtube.com/@npteliitguwahati8283?si=X6RF-imCi_4Y6xlV**

4 **https://byjus.com/maths/probability-density-function**

5 **https://www.investopedia.com/terms/q/queuing-theory.asp**

Pedagogy:

Chalk and Talk, PPT, Discussion, Assignment, Demo, Quiz and Seminar.

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MAJOR BASED ELECTIVE – III (B)

NUMBER THEORY

2021-2022 Onwards

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Semester - VI		Hours/Week – 4	
Major Based Elective – III(B)	**NUMBER THEORY**	**Credits – 3**	
Course Code – 21UMA6MBE3B		**Internal** **25**	**External** **75**

Objectives:

➢ To highlight the details and distinctions in the world of numbers.

➢ To equip the students with basic concepts of Congruences formatted for their major concepts.

➢ To prepare the students for coding through Congruences.

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Apply the concept of divisibility and the linear Diophantine equations.	**K2**
CO2	Explain permutations and combinations in Fermat's little theorem and Wilson's theorem.	**K2**
CO3	Describe the basic properties of congruences.	**K2**
CO4	Solve the congruences using Chinese Remainder theorem and Polynomial congruences.	**K3**
CO5	Compute the theory of multiplicative arithmetic function and the Mobius inversion formula.	**K3**

Mapping with Programme Outcomes:

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

S - Strong, M - Medium, L - Low

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MAJOR BASED ELECTIVE – III (B)
NUMBER THEORY
SYLLABUS

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UNIT I (12 Hours)

The Fundamental Theorem of Arithmetic:

 Euclid's Division Lemma – Divisibility – The Linear Diophantine Equation – The Fundamental Theorem of Arithmetic.

UNIT II (12 Hours)

Combinatorial and Computational Number Theory:

 Permutations and Combinations – Fermat's Little Theorem – Wilson's Theorem – Generating Functions.

UNIT III (12 Hours)

Fundamentals of Congruences:

 Basic Properties of Congruences – Residue Systems

Solving Congruences:

 Linear Congruences – The Theorems of Fermat and Wilson Revisited.

UNIT IV (12 Hours)

 Solving Congruences:

 The Chinese Remainder Theorem – Polynomial Congruences.

Arithmetic Functions:

 Combinatorial Study of $\phi(n)$.

UNIT V (12 Hours)

Arithmetic Functions:

 Formulae for d(n) and $\sigma(n)$ – Multiplicative Arithmetic Function – The Mobius Inversion Formula.

TEXT BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	George E. Andrews	Number Theory	W.B. Saunders Company	1971

CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTION
I	2	2.1 – 2.4
II	3	3.1 – 3.4
III	4 5	4.1 & 4.2 5.1 & 5.2
IV	5 6	5.3 & 5.4 6.1
V	6	6.2 – 6.4

REFERENCE BOOKS:

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	David M. Burton	Elementary Number Theory, 7th Edition	Mc Graw Hill Publishing Company	2011
2.	S.G.Telang	Number Theory	Tata McGraw-Hill Publishing Company Limited	2003
3.	Joseph H. Silverman	A Friendly Introduction to Number Theory	Pearson Education	2009

Web Links:
1. **https://www.youtube.com/watch?v=ep695eRaAyU**
2. **https://www.youtube.com/watch?v=vPRNx6ry7SM**
3. **https://www.youtube.com/watch?v=zP9t001PXiU**
4. **https://www.youtube.com/watch?v=Owcepi5zoF0**
5. **https://www.youtube.com/watch?v=nT2KAKNDG58**
6. **https://www.youtube.com/watch?v=4_1D1BBibzw**

Pedagogy:
Power point presentation, Group Discussion, Seminar, Assignment.

MAJOR BASED ELECTIVE COURSE – III (C)

WEB TECHNOLOGY
2021-2022 Onwards

Semester – VI	WEB TECHNOLOGY	Hours/Week – 4	
Major Based Elective – III (C)		Credits – 3	
Course Code – 21UMA6MBE3C		Internal 25	External 75

Objectives:

➢ To impart knowledge in scripting

➢ To establish adequate formatting and styles

➢ To design web pages and web sites

Course Outcome:

On the Successful completion of the course the student would be able to

CO Number	CO Statement	Knowledge Level
CO1	Discover the basic concepts of web technology	K1
CO2	Summarize the components of web design	K2
CO3	Identify the different type of tags and styles to create web pages	K3
CO4	Apply scripting language concepts	K4
CO5	Construct websites using HTML and Cascading Style Sheets	K5

Mapping with Programme Outcomes:

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

S-Strong, M-Medium, L-Low

WEB TECHNOLOGY
SYLLABUS

UNIT I   **(12 HOURS)**

Get Started in HTML:

Meet HTML – Understand structure -Create Documents – Add Styles – Include Scripts – Link Resources. **Structure Web Pages:** Proclaim Headings – Group Headings – Include Navigation – Complete framework – Create sections – Provide Asides – Revision Divisions

UNIT II   **(12 HOURS)**

Manage Text Content:

Insert Paragraphs – Include Quotations – Add Emphasis – Add Modifications – Add Phrasing – Retain Formatting – Use Superscript – Display Code – Direct Language – Create Hyperlinks – Access Keys - Fragment Links – Protocol Links. **Write Lists and Tables**: Unordered Lists – Ordered Lists – Description Lists – Basic Tables – Span Cells – Enhance Tables – Control Columns

UNIT III   **(12 HOURS)**

Incorporate Media Content:

Add Image – Image Maps – Reference Figures – Select Pictures – Embed Objects – Embed Vectors – Embed Frames – Add Audio - Add Video –Insert Slots – Employ Dialogs – Paint Canvas. **Produce Input Forms:** Submit Text – Input Types – Text Areas – Check Boxes – Hide Data – Upload Files – Push Buttons – Image Buttons – Add Logos – Select Options – Datalist Options – Label Controls

UNIT IV   **(12 HOURS)**

Get Started in CSS:

Meet CSS - Create Rules – Apply Rules – Select Type - Select Class – Select Identity – Select Relatives – Select Attributes – Paint Colors – Set Backgrounds. **Manipulate Text Content:** Suggest Font – Set Size – Vary Style – Use Shorthand - Align Text– Decorate Text – Change Direction - Enhance Text – Number Sections

UNIT V   **(12 HOURS)**

Introduction to JavaScript:

JavaScript in Web Pages – Advantages of JavaScript – Writing JavaScript into HTML – Basic Programming Techniques - Operators and Expressions In JavaScript - JavaScript Programming Constructs - Conditional Checking - Super Controlled - Endless Loops - Functions In JavaScript - User Defined Functions - Placing Text In A Browser - Dialog Boxes.

TEXT BOOKS:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	Mike McGrath	HTML, CSS & JavaScript in Easy Steps	In Easy Steps Limited Special Edition.	2020
2.	Ivan Bayross	Web enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP	BPB Publications, New Delhi 4th Revised Edition	Reprint 2021

REFERENCE BOOKS:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER/ EDITION	YEAR OF PUBLICATION
1.	Ben Frain	Responsive Web Design with HTML5 and CSS	Packt Publishing Ltd. UK 3rd Edition	2020
2.	Julie C Meloni, Jennifer Kymin	HTML, CSS, and JavaScript All in One	Pearson Education 3rd Edition	2018

Web links:

1. https://www.tutorialspoint.com/html5/index.htm

2. https://www.javatpoint.com/html5-tutorial

3. https://www.geeksforgeeks.org/JavaScript/

Pedagogy:

Chalk & Talk, PowerPoint Presentation, Discussion, Assignment, Demo, Quiz and Seminar.