

# **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**

**2019-2020 ONWARDS**

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

<b>PO1</b>	Demonstrate basic manipulative skills in algebra, geometry and trigonometry.
<b>PO2</b>	Communicate mathematical principles and ideas with clarity and coherence, both written and verbally, demonstrating communication skills to be used in any future career.
<b>PO3</b>	Demonstrate proficiency in linear algebra, real and complex analysis as well as areas of modern, proof-based Mathematics.
<b>PO4</b>	Compute limits and derivatives using their definitions, and use the fundamental theorem of calculus to compute definite and indefinite integrals.
<b>PO5</b>	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 2019-2020)**

Sem	Part	Course	Title	Subject Code	Ins.	Credit	Exam	Marks		Total
					Hrs		Hours	Int	Ext	
<b>I</b>	<b>I</b>	Language Course – I (LC) – Tamil*/Other Languages +#	Ikkala Ilakkiyam	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							
	<b>II</b>	English Language Course - I (ELC)	Functional Grammar for Effective Communication –I	19UE1	6	3	3	25	75	100
	<b>III</b>	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	5	3	25	75	100
		First Allied Course – I (AC)	Mathematical Statistics – I	19UMA1AC1	5	3	3	25	75	100
	<b>IV</b>	Value Education	Value Education	19UGVE	2	2	3	25	75	100
	<b>TOTAL</b>				<b>30</b>	<b>21</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>600</b>

Sem	Part	Course	Title	Subject Code	Ins.	Credit	Exam	Marks		Total
								Int	Ext	
II	I	Language Course – II (LC) - Tamil*/Other Languages +#	Idaikala Ilakkiyamum Pudhinamum	19ULT2/ 19ULH2/ 19ULS2/ 19ULF2	6	3	3	25	75	100
			Prose, Drama, History of Hindi Literature –II & Grammar - 2							
			Poetry, Textual Grammar and Alakara							
			Communication in French –II							
	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	19UMA2CC3	6	5	3	25	75	100
		First Allied Course – II (AP)	Mathematical Statistics- II (Practical)	19UMA2AC1P	5	3	3	25	75	100
		First Allied Course – III (AC)	Mathematical Statistics-III	19UMA2AC2	5	3	3	25	75	100
	IV	Environmental Studies	Environmental Studies	19UGES	2	2	3	25	75	100
	TOTAL				30	19	-	-	-	600

Sem	Part	Course	Title	Subject Code	Ins.	Credit	Exam	Marks		Tot
					Hrs		Hours	Int	Ext	
III	I	Language Course – III (LC) – Tamil*/Other Languages +#	Kappiyamum Naadagamum	19ULT3/ 19ULH3/ 19ULS3/ 19ULF3	6	3	3	25	75	100
			Medieval, Modern Poem, Poetics & History of Hindi Literature – 3							
			Prose, Textual Grammar and Vakyarachana							
			Communication in French –III							
	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)	Programming in C	19UMA3AC3	4	3	3	25	75	100
		Second Allied Course – II (AP)	Programming in C LAB	19UMA3AC2P	2	-	-	-	-	-
	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 10 <sup>th</sup> , +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	21	-	-	-	600

\*15 Days Internship during Semester Holidays

Sem	Part	Course	Title	Subject Code	Ins.	Credit	Exam Hours	Marks		Total
								Int	Ext	
IV	I	Language Course – IV(LC) - Tamil*/Other Languages +#	Pandaiya Ilakkiyam	19ULT4/ 19ULH4/ 19ULS4/ 19ULF4	6	3	3	25	75	100
			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							
	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	19UMA4CC6	5	5	3	25	75	100
		Second Allied Course – II (AP)	Programming in C LAB	19UMA3AC2P	2	2	3	40	60	100
		Second Allied Course – III (AC)	Principles of Information Technology	19UMA4AC4	5	4	3	25	75	100
		Major Based Elective-I	Discrete Mathematics	19UMA4MBE1A	4	4	3	25	75	100
			Automata Theory	19UMA4MBE1B						
	IV	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 to10 <sup>th</sup> , +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	Internship	19UMA4INT	-					
			Swayam Online Course	To be fixed Later	As Per UGC Recommendations					
	TOTAL				30	23	-	-	-	700

Sem	Part	Course	Title	Subject Code	Ins.	Credit	Exam	Marks		Total
					Hrs		Hours	Int	Ext.	
V	III	Core Course – VII (CC)	Abstract Algebra	19UMA5CC7	6	6	3	25	75	100
		Core Course – VIII (CC)	Real Analysis	19UMA5CC8	6	6	3	25	75	100
		Core Course – IX (CC)	Statics	19UMA5CC9	5	4	3	25	75	100
		Core Course – X (CC)	Methods in Numerical Analysis	19UMA5CC10	5	4	3	25	75	100
		Core Practical – I (CP)	Numerical methods with MATLAB Programming (Practical)	19UMA5CC1P	2	2	3	40	60	100
	IV	Skill Based Elective – I	Introduction to R	19UMA5SBE1A	2	2	3	25	75	100
			Introduction to Statistical Tools and Techniques – SPSS	19UMA5SBE1B						
		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						
		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	28	-	-	-	800

Sem	Part	Course	Title	Subject Code	Ins.	Credit	Exam	Marks		Total
					Hrs		Hours	Int	Ext.	
VI	III	Core Course – XI (CC)	Linear Algebra	19UMA6CC11	5	5	3	25	75	100
		Core Course – XII (CC)	Complex Analysis	19UMA6CC12	5	5	3	25	75	100
		Core Course – XIII (CC)	Dynamics	19UMA6CC13	5	4	3	25	75	100
		Core Course – XIV (CC)	Operations Research	19UMA6CC14	4	4	3	25	75	100
		Major Based Elective – II	Graph Theory	19UMA6MBE2A	4	3	3	25	75	100
			Number Theory	19UMA6MBE2B						
		Major Based Elective – III	Fuzzy Sets and Systems	19UMA6MBE3A	4	3	3	25	75	100
			Astronomy	19UMA6MBE3B						
	IV	Skill Based Elective – III	LaTeX (Practical)	19UMA6SBE3AP	2	2	3	40	60	100
			Python Programming (Practical)	19UMA6SBE3BP						
	V	Gender Studies	Gender Studies	19UGGS	1	1	3	25	75	100
		Extension Activities	Extension Activities	19UGEA	-	1	-	-	-	-
	TOTAL				30	28	-	-	-	800
	GRAND TOTAL				180	140	-	-	-	4100



## List of Allied Courses

### Group I (Any one)

1. Physics
2. Mathematical Statistics
3. Financial Accounting

### Group II (Any one)

1. Chemistry
2. Computer Science
3. Management Accounting

Language Part – I	-	4	
English Part –II	-	4	
Core Paper	-	14	
Core Practical	-	1	
Allied Paper	-	4	
Allied Practical	-	2	
Non-Major Elective	-	2	
Skill Based Elective	-	3	
Major Based Elective	-	3	
Environmental Studies	-	1	
Value Education	-	1	
Soft Skill Development	-	1	
Gender Studies	-	1	
Extension Activities	-	1	(Credit only)

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

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

# those who studied Tamil up to 10<sup>th</sup>, +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 10<sup>th</sup> or +2 but opt for other languages in degree programme

### Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60
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**  
**CORE COURSE-I (CC)**  
**DIFFERENTIAL CALCULUS AND TRIGONOMETRY**  
**2019-2020 Onwards**

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

**Objectives:**

- To inculcate the basics of differentiation and their applications.
- To introduce the notion of curvature, Evolutes and Involute 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

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

**Mapping with Programme Outcomes:**

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

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

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

**UNIT I**

Successive Differentiation: The  $n^{th}$  derivative – Standard results – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the  $n^{th}$  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**

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**

Expansions of  $\cos n\theta$  and  $\sin n\theta$  – Expansion of  $\tan n\theta$  in powers of  $\tan \theta$  – Expansion of  $\tan(A + B + C + \dots)$  (omitting examples on formation of equations) - Powers of sines and cosines of  $\theta$  in terms of functions of multiples of  $\theta$  – 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  $\theta$ .

**UNIT IV**

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

**UNIT V**

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:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title of the Book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
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:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
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:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title of the book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
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**

<b>Semester – I</b>	<b>INTEGRAL CALCULUS AND FOURIER SERIES</b>	<b>Hours/Week – 6</b>	
<b>CORE COURSE-II</b>		<b>Credits – 5</b>	
<b>Course Code – 19UMA1CC2</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**CORE COURSE-II (CC)**  
**INTEGRAL CALCULUS AND FOURIER SERIES**  
**SYLLABUS**

**UNIT I**

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**

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

**UNIT III**

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**

Fourier Series- Definition - Fourier Series expansion of periodic functions with period  $2\pi$  - Even and Odd functions.

**UNIT V**

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**

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

**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

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

**Mapping with Programme Outcomes:**

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

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



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

**UNIT I**

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**

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**

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**

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**

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:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title of the Book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
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:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
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:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title of the book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
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**  
**2019-2020 Onwards**

<b>Semester - II</b>	<b>ANALYTICAL GEOMETRY AND VECTOR CALCULUS</b>	<b>Hours/Week – 6</b>	
<b>CORE COURSE-III</b>		<b>Credits – 5</b>	
<b>Course Code – 19UMA2CC3</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**CORE COURSE-III (CC)**  
**ANALYTICAL GEOMETRY AND VECTOR CALCULUS**

**SYLLABUS**

**UNIT I**

The Plane: The general equation of the first degree in  $x, y, z$  represents a plane – The equation of the plane making intercepts  $a, b, c$  on the axes  $OX, OY, OZ$  respectively – The equation of a plane in terms of  $p$ , the length of the perpendicular from the origin to it and  $l, m, n$  the direction cosines of that perpendicular – Obtaining several forms for the equations of a plane – The equation of the plane passing through the points  $(x_1, y_1, z_1), (x_2, y_2, z_2), (x_3, y_3, z_3)$  – Direction cosines of the line which is perpendicular to a plane – Angle between the planes  $a_1x + b_1y + c_1z + d_1 = 0$  and  $a_2x + b_2y + c_2z + d_2 = 0$

**UNIT II**

The straight line: A straight line may be determined as the intersection of two planes – symmetrical form of the equations of a line – The symmetrical form of the equations of the line  $ax + by + cz + d = 0 = a_1x + b_1y + c_1z + d_1$  – Equation of a straight line passing through two given points – The condition of the line  $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$  to be parallel to the plane  $ax + by + cz + d = 0$  – Angle between the plane  $ax + by + cz + d = 0$  and the line  $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$  – The condition that two given straight lines should be coplanar – The shortest distance between two given lines.

**UNIT III**

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

#### UNIT IV

Vector Integration – line integral – work done by a force – conservative field – Scalar potential – normal surface integral – volume integral – Simple problems.

#### UNIT V

Gauss's Divergence Theorem – Green's Theorem – Stoke's Theorem – Verification of the theorems for simple problems.

#### TEXT BOOKS:

S.No	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	T.K. Manickavasagam Pillai and T.Natarajan,	A Text Book of Analytical Geometry Part II- Three dimensions	S.Viswanathan (Printers & Publishers) PVT., Limited.	2012
2.	M.L. Khanna	Vector Calculus	Jai Prakash Nath and Co.,	2002

#### CHAPTERS AND SECTIONS:

UNIT	CHAPTER	SECTIONS
I	2	1-7 [1]
II	3	1-8 [1]
III	4	1-8 [1]
IV	3	1, 2, 4 [2]
V	3	5 & 6 [2]

**REFERENCE BOOKS:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title of the book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
1.	P.Duraipandiyan, Lakshmi Duraipandian and D.Muhilan	Analytical Geometry Three dimensional	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 (AC)**  
**MATHEMATICAL STATISTICS – II (PRACTICAL)**  
**2019-2020 Onwards**

<b>Semester - II</b>	<b>MATHEMATICAL STATISTICS – II (PRACTICAL)</b>	<b>Hours/Week – 5</b>	
<b>FIRST ALLIED COURSE-II</b>		<b>Credits – 3</b>	
<b>Course Code – 19UMA2AC1P</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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



**FIRST ALLIED COURSE – II (AC)**  
**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**

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

**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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Define the chi square Distribution and discuss the applications of chi square Distribution to conduct tests of goodness of fit and independence of attributes.	<b>K2</b>
<b>CO2</b>	Explain Student's t, Fisher's t and F statistics and derive their probability Distribution.	<b>K2</b>
<b>CO3</b>	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.	<b>K3</b>
<b>CO4</b>	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.	<b>K3</b>
<b>CO5</b>	Classify the various properties of the correlation and regression co-efficient and their applications.	<b>K3</b>

**Mapping with Programme Outcomes:**

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

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

**FIRST ALLIED COURSE – III**  
**MATHEMATICAL STATISTICS – III**  
**SYLLABUS**

**UNIT I**

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**

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 of Rectangular Distribution – M.G.F. of Rectangular Distribution – Characteristic Function of Rectangular Distribution – Mean Deviation (about mean) of Rectangular Distribution.

**UNIT III**

Gamma Distribution : M.G.F. of Gamma Distribution – Cumulant 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

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

Chi-Square Distribution : Introduction – Derivation of the Chi-Square Distribution –M.G.F. of Chi-Square Distribution : Cumulant Generating Function of  $\chi^2$  Distribution – Limiting Form of  $\chi^2$  Distribution for large degree of Freedom –Characteristic Function of  $\chi^2$  Distribution – Mode and Skewness of  $\chi^2$  Distribution – Additive Property of  $\chi^2$  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  $\chi^2$  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:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title of the book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
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:**

**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:**

**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:**

**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:**

**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:**

**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**

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

**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

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

**Mapping with Programme Outcomes:**

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

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

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

**UNIT I**

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**

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**

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**

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

**UNIT v**

Theory of Numbers – Prime & Composite numbers – divisors of a given number  $N$  – Euler's Function ( $\phi(N)$ ) 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)****PROGRAMMING IN C****2019-2020 Onwards**

<b>Semester - III</b>	<b>PROGRAMMING IN C</b>	<b>Hours/Week – 4</b>	
<b>Second Allied Course-I</b>		<b>Credits – 3</b>	
Course Code – <b>19UMA3AC3</b>		<b>Internal 25</b>	<b>External 75</b>

**Objectives:**

- To Train the students to the basic concepts of programming language.
- To provide exposure to problem solving through programming.
- To inculcate complex programming language skills.

**Course Outcomes:**

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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Recall the basic operation in computer system and Identify the fundamentals of C programming	<b>K1</b>
<b>CO2</b>	Understand the concepts of operators and arrays	<b>K2</b>
<b>CO3</b>	Apply the role of Structure and Pointers	<b>K3</b>

**Mapping With Programme Outcomes:**

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

**S – Strong; M – Medium; L – Low**

**SECOND ALLIED COURSE-I (AC)**  
**PROGRAMMING IN C**

**SYLLABUS**

**UNIT I (12 HOURS)**

Introduction to C: Character set - C tokens - Keywords and identifiers- Constants-variables - Data types - Declaration of variables –Assigning values to the variables –Defining symbolic constants. Operators and Expressions: Arithmetic operators - Relational operators- Logical operators-Assignment operators - Increment and decrement operator-Conditional operator-Bitwise and special operators - Arithmetic expression- Evaluation of expression – Precedence of arithmetic operators-Type conversion in expressions- Operator precedence and Associativity.

**UNIT II (12 HOURS)**

Managing Input and Output: Reading & writing a character - Formatted input and output. Decision Making and Branching: Simple If statement, The if- else, The Switch statement – The ?: operator - The GOTO statement.

**UNIT III(12 HOURS)**

Decision Making and Looping: The while statement – The do statement – The for statement – Jumps in Loops. Array: One Dimensional array- Two dimensional Array- Initializing one and two- dimensional Array - Multidimensional arrays- Dynamic Arrays.

**UNIT IV (12 HOURS)**

User Defined Function: Elements of User Defined Function – Definition of function – Return values and their types – Function calls – Function declaration – Categories of functions. Structure and Union: Defining, Declaring, Accessing, Copying and Comparing Structure Variables – Structure initialization – Arrays of Structures – Arrays within Structures – Structure within Structures.

**UNIT V (12 HOURS)**

Pointers: Understanding Pointers-Accessing the address of a variable- Declaring and Initializing Pointers - Accessing a variable through its pointer - Chain of pointers -Pointer expressions – Pointer increments and Scale factor - Pointers and Arrays.

**TEXT BOOKS:**

S. No	Authors	Title of the Book	Publishers/Edition	Year of Publication
1.	E. Balagurusamy	Programming In ANSI C	Tata Mc Graw Hill, 7th Edition.	2017

**REFERENCE BOOKS:**

S. No	Authors	Title of the Book	Publishers/ Edition	Year of Publication
1.	Byran Gottfried	Programming with C	Tata McGraw Hill, 3 <sup>rd</sup> Edition.	2013
2	V.Rajaraman	Computer Programming in C	Prentice Hall of India Pvt Ltd, 1st Edition.	2004

**Web Links:**

1. <http://www.tutorialspoint.com/cprogramming/index.htm>
2. <http://www.cprogramming.com/tutorial/c-tutorial.html>
3. <http://www.w3schools.in/c>
4. <http://fresh2refresh.com/c-tutorial-for-beginners>

**Pedagogy:**

Chalk and Talk, PPT, Discussion and Quiz



**NON-MAJOR ELECTIVE COURSE – I (NME)**  
**MATHEMATICS FOR COMPETITIVE EXAMINATION-I**  
**2019-2020 Onwards**

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

**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

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

**Mapping With Programme Outcomes:**

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

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

**NON-MAJOR ELECTIVE COURSE – I (NME)**  
**MATHEMATICS FOR COMPETITIVE EXAMINATION-I**

**SYLLABUS**

**UNIT I**

Problems on Numbers – Problems on Ages.

**UNIT II**

Time and Distance – Calendar – Clocks.

**UNIT III**

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

**UNIT IV**

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

**UNIT V**

Logical Reasoning.

**Text Books:**

<b>S. No</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers/Edition</b>	<b>Year of Publication</b>
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:**

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

**REFERENCE BOOKS:**

<b>S. No</b>	<b>Authors</b>	<b>Title of the Book</b>	<b>Publishers/ Edition</b>	<b>Year of Publication</b>
1.	Edgar Thorpe	Test of Reasoning for Competitive Examinations	Tata McGraw-Hill Publishing Company Limited, New Delhi, 2 <sup>nd</sup> Edition,	3 <sup>rd</sup> Re-Print 2000.
2.	T.K. Sinha	80+ Practice Sets of Quantitative Aptitude for Bank PO Exams	Arihant Publication (India) limited	2002.
3.	Abhijit Guha	Quantitative Aptitude for Competitive Examinations	McGraw-Hill Publishing Company Limited, New Delhi, 5 <sup>th</sup> Edition	Re-Print 2014.

**Pedagogy:**

Chalk and Talk, PPT, Discussion and Quiz

**SEMESTER IV**  
**CORE COURSE VI – (CC)**  
**SEQUENCES AND SERIES**  
**2019-2020 Onwards**

<b>Semester - IV</b>	<b>SEQUENCES AND SERIES</b>	<b>Hours/Week – 5</b>	
<b>Core Course - VI</b>		<b>Credits – 5</b>	
<b>Course Code – 19UMA4CC6</b>		<b>Internal 25</b>	<b>External 75</b>

**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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Explain the concepts of convergent sequences, divergent sequences and series.	<b>K2</b>
<b>CO2</b>	Apply the ideas of sequences in Algebra of limits.	<b>K3</b>
<b>CO3</b>	Compute the behavior of monotonic functions.	<b>K3</b>
<b>CO4</b>	Apply the theory of Cauchy's condensation test and Cauchy's root test on series.	<b>K3</b>
<b>CO5</b>	Solve the problems based on binomial, logarithmic and exponential series.	<b>K3</b>
<b>CO6</b>	Examine infinite series using D' Alembert's ratio test.	<b>K4</b>

**Mapping with Programme Outcome:**

<b>COS/POS</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	S	S	M	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	M	M
<b>CO4</b>	S	S	S	M	M
<b>CO5</b>	S	M	S	S	S
<b>CO6</b>	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  $\sum \frac{1}{n^k}$  – 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](https://youtu.be/JKiwztS6e_s)
2. <https://youtu.be/A02NqndOan0>
3. <https://youtu.be/9sLsX9DV5Es>
4. [https://youtu.be/O3\\_IGStTGVO](https://youtu.be/O3_IGStTGVO)
5. <https://youtu.be/BydVprh9NgO>

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

**MAJOR BASED ELECTIVE COURSE (MBE) - I**  
**DISCRETE MATHEMATICS**  
**2019-2020 Onwards**

<b>Semester - IV</b>	<b>DISCRETE MATHEMATICS</b>	<b>Hours/Week – 4</b>	
<b>Major Based Elective Course (MBE) - I</b>		<b>Credits – 4</b>	
<b>Course Code – 19UMA4MBE1A</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes**

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

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

**MAJOR BASED ELECTIVE COURSE (MBE) - I**  
**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/5cvocztOtq4>
3. <https://youtu.be/w9DyAVrU8i0>
4. <https://youtu.be/qPtGlrbsXg>
5. <https://youtu.be/MH2uTVgG1bo>

**Pedagogy**

Power point presentation, Group Discussion, Seminar, Assignment.

**MAJOR BASED ELECTIVE (MBE) - I**  
**AUTOMATA THEORY**  
**2019-2020 Onwards**

<b>Semester - IV</b>	<b>AUTOMATA THEORY</b>	<b>Hours/Week – 4</b>	
<b>Major Based Elective Course (MBE) - I</b>		<b>Credits – 3</b>	
<b>Course Code – 19UMA4MBE1B</b>		<b>Internal 25</b>	<b>External 75</b>

**Objectives:**

- To introduce the definition of Automaton.
- To enable thorough knowledge in constructing the Regular Expressions.
- To study the Pumping lemma for regular sets.

**Course Outcome:**

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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Study Deterministic and Nondeterministic Finite state automata.	<b>K1</b>
<b>CO2</b>	Outline the Chomsky classification of languages.	<b>K1</b>
<b>CO3</b>	Understand the concepts of Regular Expressions.	<b>K2</b>
<b>CO4</b>	Impart knowledge in Pumping lemma for Regular sets.	<b>K3</b>
<b>CO5</b>	Apply the simplification of context free grammars.	<b>K3</b>

**Mapping with Programme Outcomes:**

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

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

## **MAJOR BASED ELECTIVE - I**

### **AUTOMATA THEORY**

#### **SYLLABUS**

#### **UNIT I**

##### **THE THEORY OF AUTOMATA**

**(6 Hours)**

Definition of an Automaton – Description of a Finite Automaton –Transition Systems – Properties of Transition Functions –Acceptability of a string by a Finite Automaton– Nondeterministic Finite State Machines –The equivalence of DFA and NDFA.

#### **UNIT II**

##### **FORMAL LANGUAGES**

**(6 Hours)**

Basic Definitions and Examples: Definition of a Grammar – Derivations and the Language Generated by a Grammar. Chomsky Classification of Languages – Languages and their Relation–Recursive and Recursively Enumerable sets – Operations on Languages.

#### **UNIT III**

##### **REGULAR SETS AND REGULAR GRAMMARS**

**(6 Hours)**

Regular Expressions: Identities for Regular Expressions. Finite Automata and Regular expressions: Transition System Containing  $\lambda$  -moves – NDFAs with  $\lambda$  -moves and Regular Expressions– Conversion of Nondeterministic Systems to Deterministic Systems– Algebraic Methods Using Arden's Theorem- Construction of a finite Automata Equivalent to a Regular Expressions– Equivalence of Two Finite Automata – Equivalence of Two Regular Expressions.

#### **UNIT IV**

##### **REGULAR SETS AND REGULAR GRAMMARS**

**(4 Hours)**

Pumping Lemma for Regular Sets – Applications of Pumping Lemma – Closure Properties of Regular Sets –Regular Sets and Regular Grammars.

#### **UNIT V**

##### **CONTEXT FREE LANGUAGES**

**( 2 Hours)**

Context-free Languages and Derivation Trees: Derivation Trees –Ambiguity in Context Free Grammars.

**TEXT BOOKS:**

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	K. L. P. Mishra and N. Chandrasekaran	Theory of Computer Science: Automata, Languages and Computation- Third Edition	Prentice Hall of India Private Limited	2008

**CHAPTERS AND SECTIONS:**

Unit	Chapter	Sections
I	3	3.1 to 3.7
II	4	4.1: 4.1.1, 4.1.2, 4.2 to 4.5
III	5	5.1: 5.1.1, 5.2: 5.2.1 to 5.2.7
IV	5	5.3 to 5.6
V	6	6.1: 6.1.1, 6.2

**REFERENCE BOOKS:**

S. No.	Authors Name	Title of the Book	Publishers Name	Year of Publication
1.	John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman	Introduction to Automata theory, Languages and Computations, Third Edition	Pearson Education.	2009
2.	Alfred V. Aho and Jeffrey D. Ullman,	Principles of Compiler Design	Narosa Publishing House Pvt.,	2002

**Web links:**

1. <https://youtu.be/Y9PwXM6KN34>
2. <https://youtu.be/6YH9wsLM-8o>
3. [https://youtu.be/xEvC-t\\_OI3o](https://youtu.be/xEvC-t_OI3o)
4. <https://youtu.be/WrzaPNj9OZ4>
5. <https://youtu.be/6aRJONYy4s>

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

**NON-MAJOR ELECTIVE (NME)– II**  
**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**  
**2019-2020 Onwards**

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

**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

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

**Mapping with Programme Outcomes:**

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

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

**NON-MAJOR ELECTIVE – II (NME)**  
**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**  
**SYLLABUS**

**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:**

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

**CHAPTERS AND SECTIONS:**

<b>Unit</b>	<b>Chapter</b>	<b>Pages</b>
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, 5 <sup>th</sup> Edition	2014

**Web links:**

1. <https://youtu.be/8BeIUzLqOTE>
2. <https://youtu.be/pShzc9AOMos>
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-VII (CC)

#### ABSTRACT ALGEBRA

2019-2020 Onwards

<b>Semester - V</b>	<b>ABSTRACT ALGEBRA</b>	<b>Hours/Week – 6</b>	
<b>CORE COURSE-VII</b>		<b>Credits – 6</b>	
<b>Course Code – 19UMA5CC7</b>		<b>Internal 25</b>	<b>External 75</b>

#### 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

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

#### Mapping with Programme Outcomes:

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

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



**CORE COURSE-VII (CC)**  
**ABSTRACT ALGEBRA**  
**SYLLABUS**

**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, 2 <sup>nd</sup> Edition	Springer Verlag	1990

**Web links:**

1. <https://youtu.be/CJpZJLYKk0I>
2. <https://youtu.be/mcX0sMnYyMU>
3. <https://youtu.be/lrOMV4zGF44>
4. <https://youtu.be/7LtpPI46O0O>
5. <https://youtu.be/K1iuXqHFWRw>

**Pedagogy:**

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

**CORE COURSE – VIII (CC)****REAL ANALYSIS****2019 – 2020 Onwards**

<b>Semester – V</b>	<b>REAL ANALYSIS</b>	<b>Hours/Week – 6</b>	
<b>Core Course – VIII</b>		<b>Credits – 6</b>	
<b>Course Code - 19UMA5CC8</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**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 – VIII (CC)****REAL ANALYSIS****SYLLABUS****Unit I (18 Hours)****Sets and functions**

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

**Unit II (18 Hours)****Limits and metric spaces**

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

**Unit III (18 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  $\mathbb{R}^1$  – The distance from a point to a set.

**Unit IV (18 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****(18 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:**

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

**CHAPTERS AND SECTIONS:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
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.,	3 <sup>rd</sup> 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/XiiT88Czx5c?t=15>
2. <https://youtu.be/1diSwLMJpvs?t=626>
3. <https://youtu.be/YEG18ISnThE?t=4>
4. <https://youtu.be/4TzGkHEnn7g?t=3>
5. <https://youtu.be/y5tni8My-VY?t=4>

**Pedagogy:**

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

## **CORE COURSE – IX (CC)**

### **STATICS**

**2019-2020 Onwards**

<b>Semester – V</b>	<b>STATICS</b>	<b>Hours/Week – 5</b>	
<b>Core Course IX - (CC)</b>		<b>Credits – 4</b>	
<b>Course Code – 19UMA5CC9</b>		<b>Internal 25</b>	<b>External 75</b>

#### **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

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

**Mapping with Programme Outcome:**

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

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

**CORE COURSE –IX (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\\_4uZkSO](https://youtu.be/FdJF_4uZkSO)
2. [https://youtu.be/JJX3-af\\_JOw](https://youtu.be/JJX3-af_JOw)
3. <https://youtu.be/YqtrfO4H7V8>
4. <https://youtu.be/OBWk996hg5E>
5. <https://youtu.be/xP1lpC1e1VM>

**Pedagogy:**

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

**CORE COURSE – X (CC)**  
**METHODS IN NUMERICAL ANALYSIS**  
**2019-2020 Onwards**

<b>Semester – V</b>	<b>METHODS IN NUMERICAL ANALYSIS</b>	<b>Hours/Week –5</b>	
<b>Core Course – X (CC)</b>		<b>Credits – 4</b>	
<b>Course Code – 19UMA5CC10</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**CORE COURSE – X (CC)**  
**METHODS IN NUMERICAL ANALYSIS**  
**SYLLABUS**

**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=3i0c\\_FhOt5U](https://www.youtube.com/watch?v=3i0c_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=OugqSa3G1-w>

**Pedagogy:**

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

**CORE PRACTICAL – I (CP)****NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)****2019-2020 Onwards**

Semester – V	NUMERICAL METHODS WITH MATLAB PROGRAMMING (PRACTICAL)	Hours/Week – 2	
Core Practical –I (CP)		Credits – 2	
Course Code – 19UMA5CC1P		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**

**CORE PRACTICAL – I (CP)**  
**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.



**SKILL BASED ELECTIVE – I (A)****INTRODUCTION TO R****2019-2020 Onwards**

<b>Semester – V</b>	<b>INTRODUCTION TO R</b>	<b>Hours/Week – 2</b>	
<b>Skill Based Elective –I(A)</b>		<b>Credits – 2</b>	
<b>Course Code – 19UMA5SBE1A</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**SKILL BASED ELECTIVE – I (A)****INTRODUCTION TO R****SYLLABUS****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:**

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

**CHAPTERS AND SECTIONS:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
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/IL0s1coNtRk>
5. [https://youtu.be/S.Ipd7KC18fO?list=PLJ5C6qdA\\_vBEfE7qtEi8PvRK8x55jsUO](https://youtu.be/S.Ipd7KC18fO?list=PLJ5C6qdA_vBEfE7qtEi8PvRK8x55jsUO)

**Pedagogy:**

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

**SKILL BASED ELECTIVE- I (B)**  
**INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS**  
**2019-2020 Onwards**

<b>Semester – V</b>	<b>INTRODUCTION TO STATISTICAL TOOLS AND TECHNIQUES - SPSS</b>	<b>Hours/Week – 2</b>	
<b>Skill Based Elective- I (B)</b>		<b>Credits – 2</b>	
<b>Course Code – 19UMA5SBE1B</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping With Programme Outcomes:**

<b>COS/POS</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	M	S	M
<b>CO4</b>	S	M	S	S	S
<b>CO5</b>	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:**

<b>S. No.</b>	<b>Authors Name</b>	<b>Title of the Book</b>	<b>Publishers Name</b>	<b>Year of Publication</b>
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, 3 <sup>rd</sup> 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- 2 <sup>nd</sup> Edition.	2014

**Web links:**

1. <https://youtu.be/Bku1p481z80>
2. <https://www.youtube.com/watch?v=zEBUfZEBWQ>
3. <https://youtu.be/DmS63ivVjis>
4. <https://youtu.be/i8lmUkB4lag>

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.



**SKILL BASED ELECTIVE – II (A)**  
**STATISTICAL TOOLS AND TECHNIQUES – R PROGRAMMING (PRACTICAL)**  
**2019-2020 Onwards**

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

**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

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

**Mapping with Programme Outcomes:**

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

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

## **SILL 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](https://youtu.be/_V8eKsto3Ug)
2. <https://youtu.be/BvKETZ6kr9Q>
3. <https://youtu.be/HP.In1CMvtmI>
4. <https://youtu.be/ANMuug502rE>
5. <https://youtu.be/I6EJo8x1wZE>

#### **Pedagogy:**

Power point presentation, Hands on training.

**SKILL BASED ELECTIVE – II (B)**  
**STATISTICAL TOOLS AND TECHNIQUES – SPSS (PRACTICAL)**  
**2019-2020 Onwards**

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

**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

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

**Mapping with Programme Outcomes:**

<b>COS/POS</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	M	S	S	M
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	M	S	S	M
<b>CO5</b>	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=zEBUfZEBWO>
3. <https://www.youtube.com/watch?v=bapuGciwiLO>
4. <https://www.youtube.com/watch?v=C2Oa5d9ij0Y>
5. <https://www.youtube.com/watch?v=cNrnSEWKJgg>

**Pedagogy:**

Power Point Presentation, Hands on training.

**SEMESTER VI**  
**Core Course – XI (CC)**  
**LINEAR ALGEBRA**  
**2019-2020 Onwards**

<b>Semester - VI</b>	<b>LINEAR ALGEBRA</b>	<b>Hours/Week –5</b>	
<b>Core Course – XI (CC)</b>		<b>Credit – 5</b>	
<b>Course Code – 19UMA6CC11</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**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 – XI (CC)**

**LINEAR ALGEBRA**

**2019-2020 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 Eastern 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/1XIT3Y2ovAU>
2. <https://youtu.be/Pc2dWW3aSrK>
3. <https://youtu.be/ERfhtPBEYVA>
4. <https://youtu.be/6NFIso7APY>
5. <https://youtu.be/fdsgsMP9JnA>

**Pedagogy:**

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



**CORE COURSE–XII(CC)****COMPLEX ANALYSIS****2019-2020 Onwards**

<b>Semester – VI</b>	<b>COMPLEX ANALYSIS</b>	<b>Hours/Week – 5</b>	
<b>Core Course –XII (CC)</b>		<b>Credit – 5</b>	
<b>Course Code – 19UMA6CC12</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**CORE COURSE –XII (CC)****COMPLEX ANALYSIS**

**2019-2020 Onwards**

**UNIT I**

**Analytical Functions: (15 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**

**(15 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**

**(15 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

(15 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

(15 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 – Rouché'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, 1 <sup>st</sup> Edition, New Delhi.	2014

**Web links:**

1. <https://www.youtube.com/watch?v=b5VUnapu-gs>.
2. <https://www.youtube.com/watch?v=2v95JHiapxU>.
3. <https://www.youtube.com/watch?v=WBvRL-OCEN8>.
4. [https://www.youtube.com/watch?v=qjpLIIVo\\_6E](https://www.youtube.com/watch?v=qjpLIIVo_6E).
5. <https://www.youtube.com/watch?v=o77UV7YrWvw>.

**Pedagogy:**

Power Point Presentation, Group Discussion, Seminar, Assignment.

**CORE COURSE – XIII (CC)****DYNAMICS****2019-2020 Onwards**

<b>Semester – VI</b>	<b>DYNAMICS</b>	<b>Hours/Week – 5</b>	
<b>Core Course - XIII (CC)</b>		<b>Credits – 4</b>	
<b>Course Code – 19UMA6CC13</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**CORE COURSE – XIII (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:**

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

**CHAPTERS AND SECTIONS:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
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:**

<b>S.No</b>	<b>Authors Name</b>	<b>Title Of The Book</b>	<b>Publishers Name</b>	<b>Year Of Publication</b>
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/40RU9IWdfTA>
2. <https://youtu.be/qk7KV0lIKrM>
3. [https://youtu.be/4HZtV\\_PGHo0](https://youtu.be/4HZtV_PGHo0)
4. <https://youtu.be/uM2HpLBVAkA>
5. [https://youtu.be/MlNmIY\\_yoZ0](https://youtu.be/MlNmIY_yoZ0)
6. <https://youtu.be/NsNUuSxaa2Y>

**Pedagogy:**

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



**CORE COURSE – XIV (CC)**  
**OPERATIONS RESEARCH**

**2019-2020 Onwards**

<b>Semester - VI</b>	<b>OPERATIONS RESEARCH</b>	<b>Hours/Week – 4</b>	
<b>CORE COURSE - XIV</b>		<b>Credits – 4</b>	
<b>Course Code - 19UMA6CC14</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes**

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

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

**CORE COURSE – XIV (CC)**  
**OPERATIONS RESEARCH**  
**SYLLABUS**

**UNIT I**

**(12 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**

**(12 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**

**(12 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**

**(12 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****(12 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/M8POtpPtOZc>
5. <https://youtu.be/8IRrgDoV8Eo>

**Pedagogy:**

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

## MAJOR BASED ELECTIVE – II (A)

### GRAPH THEORY

2019-2020 Onwards

<b>Semester – VI</b>	<b>GRAPH THEORY</b>	<b>Hours/Week – 4</b>	
<b>Major Based Elective – II (A)</b>		<b>Credits – 3</b>	
<b>Course Code – 19UMA6MBE2A</b>		<b>Internal</b> <b>25</b>	<b>External</b> <b>75</b>

#### 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

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

**Mapping with Programme Outcomes:**

<b>COS\POS</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	M	S	S	M
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	M	S	S	M
<b>CO5</b>	S	S	S	S	S

S – Strong, M – Medium, L – Low.

**MAJOR BASED ELECTIVE – II (A)****GRAPH THEORY****SYLLABUS****UNIT I****(12 Hours)****Introduction:**

Introduction - The Königsberg 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:**

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

**CHAPTERS AND SECTIONS:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
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/AtDgXvluW-Y>
2. <https://youtu.be/gxL6kCc9vS4>
3. <https://youtu.be/ONdaOOJK574>
4. <https://youtu.be/mm9YUqZTsNE>
5. <https://youtu.be/wnYtITkWAYA>
6. [https://youtu.be/amaH38\\_mXK4](https://youtu.be/amaH38_mXK4)

**Pedagogy:**

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



**MAJOR BASED ELECTIVE – II (B)**  
**NUMBER THEORY**  
**2019-2020 Onwards**

<b>Semester - VI</b>	<b>NUMBER THEORY</b>	<b>Hours/Week – 4</b>	
<b>Major Based Elective – II(B)</b>		<b>Credits – 3</b>	
<b>Course Code – 19UMA6MBE2B</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**MAJOR BASED ELECTIVE – II (B)****NUMBER THEORY****SYLLABUS****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	4.1 & 4.2
	5	5.1 & 5.2
IV	5	5.3 & 5.4
	6	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, 7 <sup>th</sup> 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](https://www.youtube.com/watch?v=4_1D1BBibzw)

**Pedagogy:**

Power point presentation, Group Discussion, Seminar, Assignment.

**MAJOR BASED ELECTIVE COURSE – III (A)**  
**FUZZY SETS AND SYSTEMS**  
**2019-2020 Onwards**

<b>Semester – VI</b>	<b>FUZZY SETS AND SYSTEMS</b>	<b>Hours/Week – 4</b>	
<b>Major Based Elective – III (A)</b>		<b>Credits – 3</b>	
<b>Course Code – 19UMA6MBE3A</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

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

**MAJOR BASED ELECTIVE – III (A)**

**FUZZY SETS AND SYSTEMS**

**SYLLABUS**

**UNIT I**

**(12 Hours)**

**FUZZY SET THEORY:**

Introduction – Fuzzy Versus Crisp – Number System – Interval – Sets – Representation of a Set – Types of Sets – Subsets – Universal Set – Venn Diagrams – Operations on Sets – Difference of Two Sets – Some Important Results – Some More Results – Some Results on Venn Diagrams – 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  $\alpha$  -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.

##### **TEXT BOOKS:**

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

##### **CHAPTERS AND SECTIONS:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>SECTIONS</b>
I	1	1.1 - 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

**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/6daiRieEOIU>
4. <https://youtu.be/N8yhE1GaaOc>
5. [https://youtu.be/\\_po4FxxE9c8](https://youtu.be/_po4FxxE9c8)

**Pedagogy:**

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



**MAJOR BASED ELECTIVE – III (B)**  
**ASTRONOMY**  
**2019–2020 Onwards**

<b>Semester – VI</b>	<b>ASTRONOMY</b>	<b>Hours/Week – 4</b>	
<b>Major Based Elective – III (B)</b>		<b>Credits – 3</b>	
<b>Course Code -19UMA6MBE3B</b>		<b>Internal 25</b>	<b>External 75</b>

**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

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

**Mapping with Programme Outcomes:**

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

**S–Strong, M–Medium, L–Low**

**MAJOR BASED ELECTIVE – III (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:**

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

**CHAPTERS AND SECTIONS:**

<b>UNIT</b>	<b>CHAPTER</b>	<b>ART</b>
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/F6Tkb8svTK8>
4. <https://youtu.be/re3oEKX6Fks>
5. <https://youtu.be/ZS2FvliOXsk>

**Pedagogy:**

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

**SKILL BASED ELECTIVE – III (A)****LaTeX (PRACTICAL)****2019-2020 Onwards**

<b>Semester – VI</b>	<b>LaTeX (PRACTICAL)</b>	<b>Hours/Week – 2</b>	
<b>Skill Based Elective – III (A)</b>		<b>Credits – 2</b>	
<b>Course Code – 19UMA6SBE3AP</b>		<b>Internal 40</b>	<b>External 60</b>

**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

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

**Mapping with Programme Outcomes:**

<b>COS/POS</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	M
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	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=fCzE5gDy60g>
2. <https://www.youtube.com/watch?v=0ivLZh9xK1O>
3. <https://www.youtube.com/watch?v=bCumVPGR4ts>
4. <https://www.youtube.com/watch?v=kefvRACdXHs>
5. [https://www.youtube.com/watch?v=8hyt3ywt1H8&list=RDCMUUCGCHc7LsEYT6\\_2dOauh2NYw&index=8](https://www.youtube.com/watch?v=8hyt3ywt1H8&list=RDCMUUCGCHc7LsEYT6_2dOauh2NYw&index=8)

#### **Pedagogy:**

Power point presentation, Hand on Training.

**SKILL BASED ELECTIVE – III (B)**  
**PYTHON PROGRAMMING (PRACTICAL)**  
**2019-2020 Onwards**

<b>Semester – VI</b>	<b>PYTHON PROGRAMMING (PRACTICAL)</b>	<b>Hours/Week – 2</b>	
<b>Skill Based Elective –III(B)</b>		<b>Credits – 2</b>	
<b>Course Code – 19UMA6SBE3BP</b>		<b>Internal 40</b>	<b>External 60</b>

**Objectives:**

- To explore and understand how to use python.
- To describe the core syntax and semantics of Python programming language.
- To understand how to create and manipulate data's in python.

**Course Outcome:**

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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
<b>CO1</b>	Interpret the fundamental Python syntax and the use of Python input statements.	<b>K2</b>
<b>CO2</b>	Classify various control structures of Python in simple programs.	<b>K3</b>
<b>CO3</b>	Compute simple programs using input statements of Python programming language.	<b>K3</b>
<b>CO4</b>	Infer the usage of Dictionaries, Sets and Object-Oriented programming concepts in Python.	<b>K4</b>
<b>CO5</b>	Explain the need for working with functions in Python.	<b>K2</b>

**Mapping with Programme Outcomes:**

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

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

**SKILL BASED ELECTIVE – III (B)**  
**PYTHON PROGRAMMING (PRACTICAL)**  
**SYLLABUS**

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method).
3. Exponentiation (power of a number).
4. Find the maximum of a list of numbers.
5. Linear search and Binary search.
6. Selection sort, Insertion sort and Merge sort.
7. First n prime numbers.
8. Multiply matrices.
9. Programs that take command line arguments (word count).
10. Find the most frequent words in a text read from a file.

**Web links:**

1. <https://youtu.be/rfscVS0vtbw>
2. <https://youtu.be/uOrJ0TkZlc>
3. <https://youtu.be/1ODvkkdyGw0>
4. <https://youtu.be/t8pPdKYpowI>
5. [https://youtu.be/woVJ4N5nl\\_s](https://youtu.be/woVJ4N5nl_s)

**Pedagogy:**

Power point presentation, Hand on Training.