

# B.Sc. MATHEMATICS

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
I	20U1LT1/LA1/LF1/LH1/LU1	I	Language – I		6	3	25	75	100
	20UCN1LE1	II	English - I		6	3	25	75	100
	20UMA1CC1	III	Core – I	Differential Calculus & Trigonometry	5	5	25	75	100
	20UMA1CC2		Core – II	Solid Geometry	3	2	25	75	100
	20UPH1AC1		Allied –I	Fundamentals of Physics	5	4	25	75	100
	20UPH1AC2P	IV	Allied –II	Properties of Matter – Practicals	3	2	25	75	100
	20UCN1AE1		AEC-I	Value Education	2	2	-	100	100
			<b>TOTAL</b>		<b>30</b>	<b>21</b>			<b>700</b>
II	20U2LT2/LA2/LF2/LH2/LU2	I	Language – II		6	3	25	75	100
	20UCN2LE2	II	English – II		6	3	25	75	100
	20UMA2CC3P	III	Core – III	Mathematical Computations using C++	6	5	25	75	100
	20UMA2CC4		Core – IV	Classical Algebra	3	2	25	75	100
	20UPH2AC3		Allied – III	Essentials of Physics	4	3	25	75	100
	20UPH2AC4P	IV	Allied –IV	Optical, Thermal and Electricity - Practicals	3	2	25	75	100
	20UCN2SE1		Skill Enhancement Course - I @	Soft Skills Development	2	2	-	100	100
			<b>TOTAL</b>		<b>30</b>	<b>20</b>			<b>700</b>
III	20U3LT3/LA3/LF3/LH3/LU3	I	Language– III		6	3	25	75	100
	20UCN3LE3	II	English – III		6	3	25	75	100
	20UMA3CC5	III	Core– V	Multi variate Calculus	4	4	25	75	100
	20UMA3CC6		Core– VI	ODE & Laplace Transforms	3	2	25	75	100
	20UMA3AC5		Allied– V	Mathematical Statistics-I	4	3	25	75	100
	20UMA3AC6	IV	Allied–VI	Mathematical Statistics-II	3	2	25	75	100
	20UMA3GE1		Generic Elective I #		2	2	-	100	100
	20UCN3AE2		AEC-II	Environmental Studies	2	2	-	100	100
			<b>TOTAL</b>		<b>30</b>	<b>21</b>			<b>800</b>
IV	20U4LT4/LA4/LF4/LH4/LU4	I	Language–IV		6	3	25	75	100
	20UCN4LE4	II	English– IV		6	3	25	75	100
	20UMA4CC7	III	Core– VII	Advanced Calculus	5	5	25	75	100
	20UMA4CC8		Core - VIII	PDE & Fourier Series	3	2	25	75	100
	20UMA4AC7		Allied– VII	Mathematical Statistics-III	4	3	25	75	100
	20UMA4AC8P	IV	Allied–VIII	Statistical Lab using R and SPSS	4	2	25	75	100
	20UMA4GE2		Generic Elective - II#		2	2	-	100	100
	20UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-
			<b>TOTAL</b>		<b>30</b>	<b>21</b>			<b>700</b>
V	20UMA5CC9	III	Core – IX	Mechanics	6	5	25	75	100
	20UMA5CC10		Core – X	Real Analysis	5	5	25	75	100
	20UMA5CC11		Core – XI	Algebra	5	5	25	75	100
	20UMA5CC12	IV	Core - XII	Numerical Methods	5	5	25	75	100
	20UMA5DE1		DSE – I **		5	4	25	75	100
	20UMA5SE2P		Skill Enhancement Course II@		2	2	-	100	100
	20UMA5SE3	IV	Skill Enhancement Course – III @		2	2	-	100	100
	20UMA5EC1		Extra Credit Course - I	General Intelligence for competitive examinations	-	4*	--	100*	100*
			<b>TOTAL</b>		<b>30</b>	<b>28</b>			<b>700</b>
VI	20UMA6CC13	III	Core– XIII	Linear Algebra	5	5	25	75	100
	20UMA6CC14		Core– XIV	Complex Analysis	5	5	25	75	100
	20UMA6CC15		Core - XV	Number Theory	5	5	25	75	100
	20UMA6CC16	IV	Core - XVI	Operations Research	5	5	25	75	100
	20UMA6DE2		DSE II **		5	4	25	75	100
	20UMA6DE3		DSE III **		4	4	25	75	100
	20UCN6AE3	IV	AEC-III	Gender Studies	1	1	-	100	100
	20UMA6EC2		Extra Credit Course - II	Mathematics for competitive examinations	-	4*	--	100*	100*
	20UMAAECA		Extra Credit Course for all	Online Course	-	1*	--	-	-
			<b>TOTAL</b>		<b>30</b>	<b>29</b>			<b>700</b>
			<b>GRAND TOTAL</b>		<b>180</b>	<b>140</b>	-	-	<b>4300</b>

\* Not Considered for Grand Total and CGPA.

**# Generic Elective for other major department**

SEM	COURSE TITLE
III	Quantitative Aptitude
IV	Reasoning Ability

**@ Skill Enhancement Courses**

SEM	Elective No.	COURSE CODE	COURSE TITLE
V	II	20UMA5SE2AP	Maple
		20UMA5SE2B	Fuzzy Sets
V	III	20UMA5SE3A	MiniProject using e – Mathematical Tool(Group)
		20UMA5SE3BP	PageMaker

**\*\* Discipline Specific Elective**

SEM	D S Elective No.	COURSE CODE	COURSE TITLE
V	I	20UMA5DE1A	Graph Theory
		20UMA5DE1B	Combinatorics
VI	II	20UMA6DE2A	Astronomy
		20UMA6DE2B	Data Structures and Algorithms
VI	III	20UMA6DE3A	Mathematica and MATLAB
		20UMA6DE3B	Z and Fourier Transform

**Allied Mathematics for B.Sc. Computer Science**

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
I	20UMA1AC1	III	Allied –I	Calculus and Differential Equations	4	3	25	75	100
	20UMA1AC2		Allied –II	Numerical Methods	4	3	25	75	100
			TOTAL		8	6			200
II	20UMA2AC3	III	Allied – III	Operations Research	4	3	25	75	100
	20UMA2AC4		Allied –IV	Statistics	3	2	25	75	100
			TOTAL		7	5			200
	GRAND TOTAL				15	11	-	-	400

**Allied Mathematics for B.Sc. (Physics)**

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
III	20UMA3AC5:2	III	Allied–V	Differential and Integral Calculus	4	3	25	75	100
	20UMA3AC6:2		Allied–VI	Algebra and Trigonometry	3	2	25	75	100
			TOTAL		7	5			200
IV	20UMA4AC7:2	III	Allied– VII	Differential Equations	4	3	25	75	100
	20UMA4AC8:2		Allied–VIII	Vector Calculus and Fourier series	4	2	25	75	100
			TOTAL		8	5			200
	GRAND TOTAL				15	10	-	-	400

**Allied Mathematics for B.Sc. (Chemistry)**

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
III	20UMA3AC5:3	III	Allied–V	Differential Calculus	4	3	25	75	100
	20UMA3AC6:3		Allied–VI	Algebra and Trigonometry	3	2	25	75	100
			TOTAL		7	5			200
IV	20UMA4AC7:3	III	Allied– VII	Ordinary and Partial Differential Equations	4	3	25	75	100
	20UMA4AC8:3		Allied–VIII	Statistics and Vector Calculus	4	2	25	75	100
			TOTAL		8	5			200
	GRAND TOTAL				15	10	-	-	400

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UMA1CC1	Core – I	DIFFERENTIAL CALCULUS AND TRIGONOMETRY	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Apply domain knowledge for derivatives and Trigonometrically transformation of functions with examples.
2. Evaluate the maxima, minima and Lagrange's method of undetermined multipliers
3. Demonstrate the give examples for curvature, evolutes and involutes
4. Discuss the expansion of trigonometric multiple functions.
5. Classify hyperbolic functions with examples.

### UNIT I

**15 hours**

Successive Differentiation: The nth derivatives of Standard result - Trigonometrical transformation of functions - #Formation of equations involving derivatives# - Leibnitz formula for the nth derivative of a product - Related problems.

### UNIT II

**15 hours**

#Homogeneous functions# - Partial derivatives of a function of two functions - Maxima and Minima of function of two variables - Lagrange's Method of undetermined Multipliers.

### UNIT III

**15 hours**

Curvature: Circle, Radius and Center of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Center of Curvature – Evolute and Involute –Radius of curvature when the curve is given in polar co-ordinates.

### UNIT IV

**15 hours**

Expansion of  $\sin n\theta$ ,  $\cos n\theta$ , and  $\tan n\theta$  - Powers of sines and cosines of  $\theta$  in terms of functions of multiples of  $\theta$ .

### UNIT V

**15 hours**

Hyperbolic functions: Relations between Hyperbolic functions – Inverse hyperbolic functions – logarithms of complex numbers.

**# # Self-study portion.**

### Text Books:

T.B-1 T.K.Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. 2004.

T.B-2 S. Narayanan and T.K. Manicavachagom Pillay, Trigonometry, S. Viswanathan Publishers, Pvt. Ltd., 2006.

<b>UNIT I</b>	Chapter III	Sections 1.1 -1.6, 2.1, 2.2	<b>T.B- 1</b>
<b>UNIT II</b>	Chapter VIII	Sections 1.6, 1.7, 4, 5	<b>T.B- 1</b>
<b>UNIT III</b>	Chapter X	Sections 2.1 – 2.6	<b>T.B- 1</b>
<b>UNIT IV</b>	Chapter III	Sections 1-2, 4	<b>T.B- 2</b>
<b>UNIT V</b>	Chapter IV	Sections 1,2	<b>T.B- 2</b>
	Chapter V	Section 5	

### Books for Reference:

1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House, 2008
2. P.K.Mittal, Trigonometry, VrindaPublications(P) Ltd., 2007.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester	Code		Title of the Paper				Hours		Credits	
I	20UMA1CC1		DIFFERENTIAL CALCULUS AND TRIGONOMETRY				5		5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓		✓		✓		✓		✓
CO3		✓	✓	✓		✓		✓	✓	✓
CO4	✓	✓	✓		✓	✓	✓	✓	✓	
CO5	✓		✓	✓	✓		✓		✓	✓
Number of Matches= 38, Relationship : HIGH										

**Prepared by :**  
Dr.P.Murugananatham

**Checked by :**  
Dr.M.MohamedAlthaf

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UMA1CC2	Core – II	SOLID GEOMETRY	3	2	100	25	75

### Course Outcome:

At the end of the Course, Students will be able to:

- 1: Remember the basic concept of direction cosines and direction ratios, general equation of plane with examples.
- 2: Demonstrate and illustrate examples of the intersection of two planes.
- 3: Analyze the various forms of lines and measure the shortest distance.
- 4: Determine the radius and centre of a sphere.
- 5: Describe and discuss about a circle on a sphere with examples.

### UNIT I

9 hours

Direction cosines- Direction ratios- General equation of the plane- Intercept form-#Normal form#- Angle between two planes.

### UNIT II

9 hours

Length of the perpendicular- Equation of the planes bisecting the angle between two planes- Straight line as the intersection of two planes - Symmetrical form.

### UNIT III

9 hours

Equation of a straight line passing through two given points- Condition for a line to be parallel to a plane – Coplanar lines – Shortest distance between two skew lines – simple problems.

### UNIT IV

9 hours

Equation of a sphere - Finding centre and radius – Length of the tangent plane to a sphere.

### UNIT V

9 hours

Equation of a circle on a sphere – Intersection of two spheres – Tangent plane to a sphere – Simple problems.

**## Self-study portion.**

### Text Book:

T.K.Manicavachagom Pillay, T. Narayanan, Analytical Geometry, Part II – 3 Dimensions, S.Viswananthan Publishers Pvt Ltd.(2009)

<b>UNIT I</b>	Chapter I	Sections 7, 8
	Chapter II	Sections 1, 2, 3, 7
<b>UNIT II</b>	Chapter II	Sections 10, 11
	Chapter III	Sections 1, 2, 3
<b>UNIT III</b>	Chapter III	Sections 4, 5, 7 & 8
<b>UNIT IV</b>	Chapter IV	Sections 2-5
<b>UNIT V</b>	Chapter IV	Sections 6-8

### Books for Reference:

1. Shanti Narayanan, Analytical Solid Geometry, S.Chand & Company Ltd, New Delhi(2007).
2. M.L. Khanna, Solid Geometry, Jai Prakash Nath & co, Educational Publishers, 25<sup>th</sup> Edition (2005).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
I	20UMA1CC2		SOLID GEOMETRY			3		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓		
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓		✓	✓			✓	✓		✓
CO4	✓	✓	✓	✓	✓	✓		✓	✓	
CO5		✓	✓		✓	✓	✓		✓	✓
Number of Matches= 34, Relationship : HIGH										

**Prepared by :**

Mr. S. Masoothu  
Dr.D.Dhamodharan

**Checked by :**

Dr.M.Mohammed Jabarulla

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UMA2CC3P	Core – III	MATHEMATICAL COMPUTATIONS USING C++ - Practical	6	5	100	20	80

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Remember and understanding the concepts of basic data types, variables and operators.
2. Illustrate expressions, control structures and functions.
3. Find relation between arrays, structures and class with examples.
4. Describe constructors, destructors and operator overloading.
5. Make Use of inheritance in the mathematical problems.

### UNIT I

What is C++ – A simple C++ program – More C++ statements– Structure of C++ program – Keywords – Identifiers and Constants – Basic Data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables - Operators in C++ - Scope resolution operator – Programs using the above concepts.

### UNIT II

Expressions and their types – Control structures -Functions in C++ - The main function – Function prototyping – Inline functions – Function overloading – Programs using the above concepts.

### UNIT III

Specifying a class – Defining member functions – Nesting of member functions – Private member functions – Arrays within a class –Arrays of Objects – Friendly functions – Programs using the above concepts.

### UNIT IV

Constructors – Parameterized constructors – Multiple constructors in a class – constructors with default arguments – Copy constructor. Destructors –Defining operator overloading – Overloading unary operators - Overloading binary operators – Programs using the above concepts.

### UNIT V

Inheritance – Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Programs using the above concepts.

### List of Practical:

#### Develop C++ programs

List – A: Mathematical Computations	List – B: C++ Concepts
1. To calculate the Simple Interest	Any programs using the above concepts
2. To calculate the Area of a Circle	
3. To find out the Roots of a Quadratic Equation	
4. To find the Sum of First N Natural Numbers	
5. To find First N Fibonacci Numbers	
6. To find the GCD and LCM of Two Integers	
7. To calculate the Value of sin(x)	
8. To check if a given Number is Prime number	
9. To read a Coordinate Point and Determine its Quadrant	
10. To find the Sum of A.P Series	
11. To display Floyd's Triangle	
12. To calculate the value of nPr	
13. To sort the given numbers in ascending order.	
14. To perform matrix addition	

**Text Book:**

E. Balagurusamy, Object Oriented Programming with C++, Third Edition, Tata McGraw – Hill Publishing Company Limited, Fourth reprint 2006.

**UNIT I** Chapter 2 – 2.1, 2.3, 2.4, 2.6

Chapter 3 – 3.3 to 3.8; 3.10, 3.13, 3.14

**UNIT II**

Chapter 3 -3.19, 3.24,

Chapter 4 –4.2 to 4.3; 4.6, 4.9.

**UNIT III**

Chapter 5 – 5.3, 5.4, 5.7, 5.8, 5.9, 5.13, 5.15

**UNIT IV**

Chapter 6 – 6.2 to 6.5; 6.7, 6.11

Chapter 7 – 7.2 to 7.4

**UNIT V**

Chapter 8 – 8.2 to 8.9

**Reference Books:**

1. Herbert Schildt, The Complete Reference C++, Fourth Edition, TMH, 2003.
2. K.R. Venugopal, Raj Kumar and T. Ravi Shankar, Mastering C++, TMH, 2005.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
II	20UMA2CC3P			MATHEMATICAL COMPUTATIONS USING C++			6		5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓		✓		✓		✓		✓
CO4		✓	✓				✓	✓	✓	
CO5	✓	✓		✓	✓		✓	✓	✓	
Number of Matches= 36, Relationship : HIGH										

**Prepared By:**

Dr. M. Mohamed Jabarulla  
Dr. S. Shajitha Begum  
Mrs. Z. Sirajunisha

**Checked by:**

Dr.S.Mohamed Yusuff Ansari

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UMA2CC4	Core – IV	CLASSICAL ALGEBRA	3	2	100	25	75

#### Course Outcomes:

At the end of the Course, Students will be able to:

1. Recognize the concepts of inequalities with examples.
2. Show and illustrate Cauchy Schwartz inequality
3. Find relation between roots and coefficients of equations and symmetric functions of the roots with examples
4. Describe transformation of equation and reciprocal equation with examples.
5. Make Use of Descarte's rule, Newton's method of divisors and Horner's method to nature of roots in a Problematic Situation

#### UNIT I

9 hours

Inequalities - Triangle inequalities - Arithmetic, Geometric and Harmonic means.

#### UNIT II

9 hours

Cauchy - Schwarz inequality - Some more inequalities and related problems.

#### UNIT III

9 hours

Relation between the roots and coefficients of equations - Symmetric function of the roots - Sum of the powers of the roots of an equation.

#### UNIT IV

9 hours

Transformation of equation - #Roots with sign changed#, Roots Multiplied by a given number, #Reciprocal roots# - Reciprocal equation - Diminishing, Increasing the roots of a given equation by a given quantity.

#### UNIT V

9 hours

Descarte's rule of signs – Newton's method of divisors – Horner's method.

**# # Self-study portion.**

#### Text Books:

**T.B-1** S. Arumugam and A. Thangapandi Isaac, Sequences and series, New Gamma Publishing House (1991).

**T.B-2** T.K. Manicavachagom Pillai, T. Natarajan, and K.S. Ganapathy, Algebra, Volume-I, S. Viswanathan Publishers, Pvt. Ltd. (2004).

<b>UNIT I</b>	Chapter 2	Sections 2.1 – 2.3	<b>T.B-1</b>
<b>UNIT II</b>	Chapter 2	Sections 2.4 – 2.6	<b>T.B-1</b>
<b>UNIT III</b>	Chapter 6	Sections 11, 12, 13	<b>T.B-2</b>
<b>UNIT IV</b>	Chapter 6	Sections 15, 16, 17	<b>T.B-2</b>
<b>UNIT V</b>	Chapter 6	Sections 24, 29.4, 30	<b>T.B-2</b>

#### Books for Reference:

1. S. Arumugam, A. Thangapandi Isaac, Algebra (Theory of Equations, Inequalities and Theory of numbers), New Gamma Publishing House (2006).
2. T.K. Manicavachagom Pillai, T. Natarajan, and K.S. Ganapathy, Algebra, Volume-II, S. Viswanathan Publishers, Pvt. Ltd. (2008).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
II	20UMA2CC4		CLASSICAL ALGEBRA				3		2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓	✓	✓		✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓		✓		✓		✓		✓
CO4		✓	✓				✓	✓	✓	
CO5	✓	✓		✓	✓		✓	✓	✓	
Number of Matches= 34, Relationship : Moderate										

**Prepared By:**  
Dr.A.Prasanna  
A.Nafiunisha

**Checked by:**  
Mr.S.Masoothu

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UMA1AC1	Allied - I	<b>CALCULUS AND DIFFERENTIAL EQUATIONS (For Computer Science)</b>	5	4	100	25	75

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Recognize and Recall the basic concept of differentiation and develop the successive differentiation method with examples.
2. Apply domain knowledge for properties of definite integration and integration by parts.
3. Determine 1st order differential equations and Clairaut's form and illustrate the examples.
4. Discuss linear Ordinary differential equation and Partial differential equations.
5. Classify standard types of 1<sup>st</sup> order Partial differential equations with examples.

### UNIT I

**12 hours**

Successive Differentiation: The nth derivatives of Standard result - #Formation of equations involving derivatives # - Leibnitz formula for the nth derivative of a product - Related problems.

### UNIT II

**12 hours**

Properties of definite Integrals – Integration by parts – Reduction formulae for  $\int x^n \cos x dx$ ,  $\int x^n \sin x dx$ ,  $\int \sin n x dx$ ,  $\int \cos n x dx$ .

### UNIT III

**12 hours**

Differential equations of the first order with higher degree – Equations solvable for p- Equations Solvable for y – #Equations Solvable for x# - Clairaut's form

### UNIT IV

**12 hours**

#Linear Differential Equations with constant coefficients# - Particular integral – Special method of finding P.I. – Derivation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Different integrals of First Order P.D.E.

### UNIT V

**12 hours**

Standard type of first order partial differential equations I, II, III and IV (Clairaut's form) - Lagrange's equations.  
# # Self-study portion.

### Text Books:

**T.B-1** S.Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).

**T.B-2** S.Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-II, S. Viswanathan Publishers Pvt. Ltd.(2004).

**T.B-3** S.Narayanan, T.K. Manicavachagom Pillay, Calculus Volume-III, S. Viswanathan Publishers Pvt. Ltd.(2008).

<b>UNIT I</b>	Chapter III	Sections 1.1 – 1.4, 1.6, 2.1	T.B- 1
<b>UNIT II</b>	Chapter 1	Sections 11, 12, 13.1 – 13.4	T.B- 2
<b>UNIT III</b>	Chapter 1	Sections 5.1–5.4, 6.1, 6.2	T.B- 3
<b>UNIT IV</b>	Chapter 2	Sections 1–4	T.B-3
<b>UNIT V</b>	Chapter 4	Sections 5.1-5.4, 6	T.B-3

### Books for Reference:

1. S. Arumugam and A.Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).
2. A. Abdul Rasheed, Allied Mathematics, Vijay Nicole Imprints private limited, Chennai (2008).

**Web Source**

1. <https://nptel.ac.in/courses/111/107/111107111/>
2. <https://nptel.ac.in/courses/111/102/111102133/>
3. Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours	Credits		
I	20UMA1AC1			CALCULUS AND DIFFERENTIAL EQUATIONS (For Computer Science)			4	3		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓		✓	✓		
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓	✓	✓	✓	✓	✓		✓	✓	
CO4	✓	✓		✓	✓		✓	✓		✓
CO5	✓		✓			✓			✓	✓
Number of Matches= 31, Relationship : Moderate										

**Prepared by:**

Dr. S. Mohamed Yusuff Ansari  
Mr. T. Shiek Pareeth

**Checked by:**

Mr.N.Mohamed Thoiyab

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UMA1AC2	ALLIED –II	NUMERICAL METHODS (For Computer Science)	3	2	100	25	75

#### Course Outcomes:

At the end of the Course, Students will be able to:

1. Solve the algebraic equations of different methods with examples.
2. Show and illustrate the examples of interpolation and finite difference methods.
3. Find exact solution to the system of linear equations with examples
4. Examine the numerical integration methods.
5. Describe the numerical solution of ordinary differential equations.

#### UNIT I

**12hours**

Solution of Algebraic equations by the bisection method – The iteration method.

#### UNIT II

**12hours**

Solving algebraic equations by Newton – Raphson Method–The Generalized Newton’s method - Interpolation: Finite Differences – Forward differences – Backward difference.

#### UNIT III

**12hours**

Exact solutions to a set of linear equations using Gauss Elimination method and Gauss – Jordan Method – Inversion of a matrix using Gauss – Elimination method.

#### UNIT IV

**12hours**

Numerical Integration: Trapezoidal Rule – Simpson’s 1/3 rule - Simpson’s 3/8 rule

#### UNIT V

**12hours**

Numerical Solution of Ordinary Differential Equations - Numerical solutions to an Ordinary Differential Equation by Euler’s Method - Runge-Kutta’s second order and fourth order method.

#### Text Book:

P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company Ltd (2010).

<b>UNIT I</b>	Chapter 3	Sections 3.1 and 3.2
<b>UNIT II</b>	Chapter 3 Chapter 5	Sections 3.4, Sections 5.1
<b>UNIT III</b>	Chapter 4	Sections 4.1, 4.2 and 4.3
<b>UNIT IV</b>	Chapter 9	Sections 9.9, 9.13 and 9.14.
<b>UNIT V</b>	Chapter 11	Sections 11.9, 11.12 and 11.13.

#### Book for Reference:

Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Learning Private Limited, Fourth Edition (2009).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
I	20UMA1AC2		NUMERICAL METHODS (For Computer Science)			4		3		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓		✓		✓		✓		✓
CO4		✓	✓				✓	✓	✓	
CO5	✓	✓		✓	✓		✓	✓	✓	
Number of Matches= 34, Relationship : Moderate										

**Prepared By:**

Dr. S. Mohamed Yusuff Ansari  
Mr. T. Shiek Pareeth

**Checked by:**

Dr.U.Abuthahir

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UMA2AC3	ALLIED – III	<b>OPERATIONS RESEARCH (For Computer Science)</b>	4	3	100	25	75

### Course Outcomes

1. Recognize the features of operations research with applications and limitations with practical examples.
2. Solve LPP by Graphical and Simplex methods.
3. Discuss the Basic feasible solution of Transportation problem by different methods.
4. Determine the optimum solution for Assignment Problems with illustrations.
5. Construct Network scheduling and demonstrate critical path analysis with examples .

### UNIT I

**12 hours**

Operations Research: Natures and Futures of operations research - Mathematical Formulation of the Problem -Solving a LPP by Graphical Method - General Linear Programming Problem (LPP).

### UNIT II

**12 hours**

Canonical Standard Forms - Solving LPP by using Simplex Method – Big- M Method

### UNIT III

**12 hours**

Transportation Problem - Finding Initial Basic Feasible Solution by North West Corner Rule, Least Cost Entry Method and Vogel's Approximation method for a given Transportation Problem (Balanced and unbalanced ) - Transportation Problem - Solve Using MODI Method.

### UNIT IV

**12 hours**

Assignment Problem (Balanced and unbalanced) – Hungarian Method – Problem of sequencing Problem – processing n-jobs through two-machine- processing 2-jobs through k-machine. . Note: Theoretical proof not expected.

### UNIT V

**12 hours**

Network scheduling by CPM - Networks basic components - Logical sequencing - Rules of Network constructions - Critical Path Analysis. Note: Theoretical proof not expected.

### Text Book:

KantiSwarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons Pvt. Ltd., Twelfth Edition, 2004.

**UNIT I** Chapter 1 & 2&3 Sections 1.1, 1.2, 2.2, 3.2, 3.4

**UNIT II** Chapter 3 & 4 Sections 3.5, 4.3,

**UNIT III** Chapter 10 Sections 10.1 to 10.8 ,10.11

**UNIT IV** Chapter 10 & 11 Sections 11.1 to 11.4, 12.4,12.6

**UNIT V** Chapter 21 Sections 21.1 to 21.5

### Books for Reference:

1. P. Prem Kumar Gupta and D.S. Hira, Operations research, S. Chand (2000).
2. J.K. Sharma, Operations Research Theory and Applications, Macmillan India Ltd. (2000).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
II	20UMA2AC3		OPERATIONS RESEARCH (For Computer Science)			4		3		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓		✓	✓			✓	✓	✓
CO2		✓	✓	✓		✓	✓		✓	✓
CO3	✓		✓	✓	✓		✓	✓	✓	
CO4	✓	✓			✓	✓	✓	✓		✓
CO5	✓		✓		✓	✓		✓	✓	✓
Number of Matches= 34, Relationship : Moderate										

**Prepared by:**

Dr. P. Murganantham  
Ms. M. Affrose Begum

**Checked by:**

Dr.M.A.Rifayath Ali

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UMA2AC4	ALLIED – IV	STATISTICS (For Computer Science)	3	2	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recall and Recognize the basic concepts of mean, median and mode and discuss its merits and demerits.
2. Examine geometric and harmonic mean and discuss its merits and demerits.
3. Determine the measures of dispersions and their coefficients.
4. Interpret the different types of coefficient of correlation with examples
5. Evaluate the properties of correlation and regression coefficients.

### UNIT I

9 hours

Arithmetic Mean - Properties of Arithmetic Mean - Weighted mean – Median. #Merits and Demerits of Mean, Median#.

### UNIT II

9 hours

Mode - Geometric mean - Harmonic mean. Graphical Location of the Partition values. #Merits and Demerits of Mode, Geometric Mean and Harmonic Mean#.

### UNIT III

9 hours

Dispersion-characteristics for ideal measure of dispersion - Measures of Dispersion - Range - Q.D - M.D - S.D, coefficient of dispersion - #Coefficient of variation# - Simple problems.

### UNIT IV

9 hours

Correlation – Types of correlation – Scatter diagram – Karl- Pearson’s coefficient of correlation –Spearman’s Rank correlation

### UNIT V

9 hours

Regression- Linear - Properties of correlation and regression coefficients.  
(Numerical Problems only)

### Text Book:

S.C. Gupta &V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons,Third Edition, Reprint 2010.

<b>UNIT I</b>	Chapter 2	Sections 2.3 – 2.6
<b>UNIT II</b>	Chapter 2	Sections 2.7 – 2.9.1 & 2.11.1
<b>UNIT III</b>	Chapter 3	Sections 3.1 – 3.7, 3.7.3, 3.8
<b>UNIT IV</b>	Chapter 10	Section 10.1 to 10.3, 10.6
<b>UNIT V</b>	Chapter 10	Section 10.7

### Books for Reference:

1. Murray R. Spiegel, John Jschiller, R. Alu Srinivasan, Probability and Statistics, Third Edition, Shaum’s Outline Series (2010).
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
II	20UMA2AC4		STATISTICS (For Computer Science)				3		2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓			✓		✓		✓	✓
CO3			✓	✓		✓		✓		
CO4	✓	✓		✓	✓	✓	✓		✓	
CO5	✓		✓		✓	✓		✓	✓	✓
Number of Matches= 33, Relationship : Moderate										

**Prepared by:**

Dr. P. Murganantham  
Ms. M. Affrose Begum

**Checked by:**

Dr.A.Prasanna

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3CC5	Core – V	MULTIVARIATE CALCULUS	4	4	100	25	75

### Course Outcome:

At the end of the Course, Students will be able to:

1. Recall and discuss the double integral and application to area with examples.
2. Apply domain knowledge for triple integral with examples.
3. Determine gamma and beta functions with the examples.
4. Determine the gradient, divergent and curl
5. Demonstrate line, surface and volume integrals.

### UNIT I

**12 Hours**

Double integral – Polar and Cartesian coordinates – Change of order of integration – Jacobian – Application to area.

### UNIT II

**12 Hours**

Triple integral – Volume under triple integral – Surface area.

### UNIT III

**12 Hours**

Beta and Gamma Functions, their properties and simple problems

### UNIT IV

**12 Hours**

Introduction–Gradient – Divergent – Curl – Formulae involving  $\nabla$ –operators involving  $\nabla$  twice.

### UNIT V

**12 Hours**

Line, Surface and Volume integrals – Theorems of Gauss, Stokes and Green's (Statements only) – simple problems.

### Text Books:

**T.B-1**T.K.Manicavachagom Pillay and Others, Calculus Volume-II, S. Viswanathan Publishers Pvt. Ltd. (2007).

**T.B-2**S. Narayanan and T.K. Manicavachagom Pillay, Vector Algebra and Analysis, S. ViswanathanPublishers, Pvt. Ltd., (1995).

<b>UNIT I</b>	Chapter V	Sections 1, 2.1, 2.2, 3.1, 5.1	<b>T.B- 1</b>
	Chapter VI	Sections 1	<b>T.B- 1</b>
<b>UNIT II</b>	Chapter V	Sections 4, 6.3, 7	<b>T.B- 1</b>
<b>UNIT III</b>	Chapter VII	Sections 2.1 – 2.3, 3, 4, 5	<b>T.B- 1</b>
<b>UNIT IV</b>	Chapter IV	Sections 7 - 12	<b>T.B- 2</b>
<b>UNIT V</b>	Chapter VI	Sections 1 - 10	<b>T.B- 2</b>

### References

1. Engineering Mathematics, Volume2, Fifth Edition, Dr. M.K. Venkataraman, National Publishing Company, 2004.
2. Vector Analysis, Schaum's outline series, Murray R. Spiegel., Seymour Lipschutz, Dennis Spellman, Second Edition, McGraw Hill Book Company, 2009.

**Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:**

Semester	Code		Title of the Paper			Hours		Credits		
III	20UMA3CC5		MULTIVARIATE CALCULUS			4		4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓			✓
CO2		✓	✓	✓	✓		✓	✓	✓	
CO3	✓				✓	✓				✓
CO4	✓	✓	✓	✓			✓	✓	✓	
CO5		✓		✓	✓	✓	✓	✓	✓	✓
Number of Matches= 33, Relationship : Moderate										

**Prepared by :**

1. Mr. S. Masoothu
2. Ms. J. Sarthaj Banu

**Checked by :**

1.Kanzul Fathima

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3CC6	Core – VI	ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	3	2	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Retrieve the elementary ordinary differential equations.
2. Interpret the concept of solving differential equations.
3. Illustrate and evaluate the differential equation with initial conditions.
4. Discuss various formulae for Laplace and inverse Laplace transforms.
5. Apply the concept of Laplace transforms to solve ordinary differential equations

### UNIT I

9 hours

Linear equation – Bernoulli's equation – Exact differential equations: Sufficient condition for exact differential equations – Practical rule for solving an exact differential equations – Rules for finding integrating factor.

### UNIT II

9 hours

Equations of the first order but of higher degree: Equations solvable for  $dy/dx$  -Equations solvable for  $y$  - #Equations solvable for  $x$  – Clairaut's form – Equations that do not contain  $x$  explicitly - Equations that do not contain  $y$  explicitly - Homogeneous equations in  $x$  and  $y$ .

### UNIT III

9 hours

Linear Equations with constant coefficients - The operator  $D$  - Complementary function of a linear equation with constant coefficients – Particular integrals - General method of finding PI - Special methods for finding PI - Linear equations with variable coefficients.

### UNIT IV

9 hours

Laplace transforms – Sufficient condition for the existence of the Laplace transforms – Properties of Laplace transforms – Laplace transforms of periodic function – Some general theorems – #Evaluation of integrals#.

### UNIT V

9 hours

The inverse Laplace transforms -Inverse transforms of functions – Related problems.Application of Laplace transforms - Solution of ODE with constant coefficients – Solution of Systems of Differential equations - Solution of differential equations with variable coefficients.

**## Self-study portion.**

### Text Book:

S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, Viswanathan Publishers Pvt. Ltd., Ninth edition (1996)

<b>UNIT I:</b>	Chapter II	Sections 4, 5, 6.1 – 6.5
<b>UNIT II:</b>	Chapter IV	Sections 1 – 4
<b>UNIT III:</b>	Chapter V	Sections 1 – 5
<b>UNIT IV:</b>	Chapter IX	Sections 1 - 5
<b>UNIT V:</b>	Chapter IX	Sections 6 - 11

**Books for Reference:**

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).
3. Murray R. Spiegel, Schaum's Outline of Theory and Problems of Laplace Transforms, McGraw Hill, (1965).

**Web Source**

1. <https://www.youtube.com/watch?v=IFpT-Ptmkyg>
2. <https://www.youtube.com/watch?v=FU-7xJLpoWg&t=1282s>
3. <https://www.youtube.com/watch?v=btOCUmJkrrg&t=1062s>
4. <https://www.youtube.com/watch?v=JzaaQxkL6Ak>
5. <https://www.youtube.com/watch?v=oUivdhM1p6E>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
III	20UMA3CC6	ORDINARY DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS				3	2			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓		✓
CO2	✓		✓	✓	✓	✓	✓	✓		✓
CO3	✓		✓	✓	✓		✓		✓	✓
CO4	✓	✓	✓			✓	✓	✓	✓	
CO5		✓	✓	✓	✓		✓		✓	✓
Number of matches (✓) = 37, Relationship: High										

**Prepared by:**

1. Dr. A. Mohamed Ismayil
2. Dr. K.S. Kanzul Fathima

**Checked by:**

1. J.Sarthaj Banu

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3AC5	Allied – V	MATHEMATICAL STATISTICS – I	4	3	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recall the basic concept of measures of central tendencies with illustrate the examples.
2. Make use of measures of dispersion and coefficient of variation with examples
3. Apply domain knowledge for classical probability and prove Baye's theorem.
4. Discuss the distribution function and probability density function.
5. Examine the mathematical expectation and moment generating function with examples.

### UNIT I

**12 hours**

Measures of central tendencies- Arithmetic Mean, Properties of Arithmetic Mean, Weighted mean, Median, Mode, Geometric mean and Harmonic mean.

### UNIT II

**12 hours**

Measures of Dispersion, Skewness and Kurtosis – Dispersion, Characteristics for ideal measure of dispersion, Measures of Dispersion, Range, Q.D, M.D and S.D, coefficient of dispersion, coefficient of variation, Moments, Pearson's  $\beta$  and  $\gamma$  Co-efficients- simple problems.

### UNIT III

**12 hours**

Theory of probability- Classical probability; empirical probability; Axiomatic approach towards probability; Addition and Multiplication theorem; Conditional probability; Baye's theorem- simple problems.

### UNIT IV

**12 hours**

Random variable; Distribution function; Properties; Probability mass function; Probability density function; Joint probability mass function; Joint probability density function; Marginal and Conditional distribution – Simple problems.

### UNIT V

**12 hours**

Mathematical Expectation; Addition theorem of Expectation; Multiplication theorem of Expectation; Moment Generating Function; Cumulant Generating Function and cumulants, Additive Property of Cumulants – Simple problems.

### ## Self-study portion.

#### Text Book:

S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third Edition, Reprint 2010.

**UNIT I** Sections 2.3 - 2.9 (Except 2.5.2, 2.6.1, 2.7.1, 2.8.1, 2.9.1)

**UNIT II** Sections 3.1 – 3.7, 3.8, 3.9, 3.10

**UNIT III** Sections 4.1, 4.3.1, 4.3.2, 4.5, 4.6.2 – 4.7.5

**UNIT IV** Sections 5.1 – 5.4.1, 5.5.1 – 5.5.5

**UNIT V** Sections 6.1- 6.4, 6.9, 6.10

#### Books for Reference:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).
2. P.R.Vittal, Mathematical Statistics, Margham Publishers, Chennai (2002).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
III	20UMA3AC5	MATHEMATICAL STATISTICS – I				4	3			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓		✓
CO2			✓	✓	✓		✓	✓	✓	
CO3	✓	✓		✓		✓		✓	✓	✓
CO4		✓	✓			✓	✓		✓	
CO5	✓	✓		✓	✓	✓		✓		✓
Number of matches (✓) = 33, Relationship: Moderate										

**Prepared by:**

1. Dr.A. Prasanna
2. Dr.M.Mohamed Althaf

**Checked by:**

Dr.R.Jahir Hussain

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3AC6	Allied – VI	MATHEMATICAL STATISTICS – II	3	2	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Apply domain knowledge for Binomial distribution and Poisson distribution with examples.
2. Determine the concepts of continuous distribution and area property with illustrate the examples
3. Examine the gamma distribution and exponential distribution.
4. Demonstrate the give examples for fitting of a straight line and change of origin
5. Discuss about fitting of a power curve and fitting of exponential curves with examples.

### UNIT I

**9 hours**

Theoretical discrete distribution – Binomial distribution: Moments, Recurrence relation Moment generating Function. Poisson distribution: Moments, Recurrence relation, Moment generating Function - Simple Problems.

### UNIT II

**9 hours**

Theoretical continuous distribution - Rectangular (or) Uniform distribution, Normal distribution, Moment generating Function, Cumulant generating Function, Moments; Area Property- Simple Problems.

### UNIT III

**9 hours**

Theoretical continuous distributions – Gamma Distribution, Moment generating Function, Cumulant generating Function, Additive property, Beta Distribution of first kind, Exponential Distribution, Moment generating Function - Simple Problems.

### UNIT IV

**9 hours**

Fitting of a Straight Line - Fitting of second Degree Parabola – # Fitting of Polynomial of Kth Degree# – Change of Origin - Simple problems.

### UNIT V

**9 hours**

Most Plausible Solution of a system of Linear Equations - Conversion of Data to Linear Form – Fitting of a power curve – Fitting of Exponential curves - Simple problems.

**## Self-study portion.**

### Text Book:

S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third Edition, Reprint 2010.

Unit I	Sections 7.1, 7.2.1, 7.2.2, 7.2.6, 7.3.1, 7.3.2, 7.3.4, 7.3.5
Unit II	Sections 8.1, 8.2, 8.2.5, 8.2.6, 8.2.7, 8.2.11
Unit III	Sections 8.3, 8.3.1, 8.3.2, 8.3.3, 8.4, 8.6, 8.6.1
UNIT IV	Sections 9.1-9.1.4
UNIT V	Sections 9.2 – 9.3

**Books for Reference:**

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).
2. P.R.Vittal, Mathematical Statistics, Margham Publishers, Chennai (2002).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
III	20UMA3AC6	MATHEMATICAL STATISTICS – II				3	2			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	✓	✓	✓	✓		✓	✓	✓	✓
	CO2	✓	✓		✓	✓		✓		✓
	CO3		✓	✓	✓	✓			✓	✓
	CO4	✓	✓			✓	✓	✓	✓	
	CO5	✓	✓	✓	✓	✓		✓		✓
Number of matches (✓) = 34, Relationship: Moderate										

**Prepared by:**

1. Dr.A. Prasanna
2. Dr.M.Mohamed Althaf

**Checked by:**

Dr.R.Jahir Hussain

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3GE1	Generic Elective – I#	QUANTITATIVE APTITUDE	2	2	100	-	100

#### **UNIT I**

**6 hours**

Numbers – H.C.F and L.C.M of Numbers – Decimal Fractions – Simplification – Square Roots and Cube Roots - Average

#### **UNIT II**

**6 hours**

Problems on Numbers – Problems on Ages- Surds and Indices – Percentage – Profit and Loss- Ratio and Proportion.

#### **UNIT III**

**6 hours**

Partnership- Chain Rule -Time and work- Pipes and Cistern

#### **UNIT IV**

**6 hours**

Problems on Trains – Boats and streams - Alligations or Mixture – Simple Interest – Compound Interest

#### **UNIT V**

**6 hours**

Area – Volume and Surface Areas –Calendar- Clocks – Permutations and Combinations.

#### **Text Book:**

Dr. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Ltd, (2012).

**UNIT I** Chapters 1 to 6

**UNIT II** Chapters 7 to 12

**UNIT III** Chapters 13 to 17

**UNIT IV** Chapters 18 to 22

**UNIT V** Chapters 24,25,27,28 and 30

#### **Books for Reference:**

1. R. V. Praveen, Quantitative Aptitude and Reasoning, PHI Private Limited, (2012).
2. Edgar Thorpe, Course in Mental Ability and Quantitative Aptitude, 3rd Edition, Mc Graw Hill Education, (2012).

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4CC7	Core – VII	ADVANCED CALCULUS	5	5	100	25	75

### Course Outcome:

At the end of the Course, Students will be able to:

1. Recall and discuss the basic concepts of sets, elements and functions with examples.
2. Explain the sequences and series of  $\mathbb{R}$  with the examples
3. Examine the concept of Limit of a function on a real line with illustrate the examples
4. Investigate convergent and divergent series of real numbers.
5. Explain the convergence and divergence of the improper integrals.

### UNIT I

**15 Hours**

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

### UNIT II

**15 Hours**

Definition of a sequence and subsequence – Limit of a sequence – Convergent sequences – Divergent sequences – Bounded sequences – Monotone sequences – Operations on convergent sequences – Operations on divergent sequences.

### UNIT III

**15 Hours**

Limit superior and limit inferior – Cauchy sequences. Convergent and divergent series of Real Numbers; Series with non-negative numbers; Alternating series; Conditional convergence and absolute convergence.

### UNIT IV

**15 Hours**

Tests for absolute convergence; Series whose terms form a non-increasing sequence. Limit of a function on a real line; Metric spaces; Limits in metric spaces.

### UNIT V

**15 Hours**

Improper integrals of the first kind - integral test for series - improper integrals of the second kind - convergence, divergence and absolute convergence of the improper integrals.

### Text Book:

Richard R. Goldberg, Methods of Real Analysis, (Oxford and IBH Publishing Co.), 1970.

<b>UNIT I</b>	Chapter I	Sections 1.1 - 1.7
<b>UNIT II</b>	Chapter II	Sections 2.1 – 2.8
<b>UNIT III</b>	Chapter II	Sections 2.9, 2.10
	Chapter III	Sections 3.1 – 3.4
<b>UNIT IV</b>	Chapter III	Sections 3.6, 3.7
	Chapter IV	Sections 4.1, 4.2, 4.3
<b>UNIT V</b>	Chapter VII	Sections 7.9, 7.10

### References

1. Principles of Real analysis, Third edition, Walter Rudin, Mc-Graw Hill international edition, 1976.
2. Elements of Real Analysis, Shanti Narayan, M.D. Raisinhania, S. Chand & Company Ltd., Twelfth Revised Edition, 2011.
3. Real analysis, Volume I, K. Chandrasekhara Rao, K.S Narayan, S. Viswanathan Printers & Publishers Pvt. Ltd., 2008.
4. Sequence and Series, S. Arumugam, Issac, New Gamma Publishing House, 1993

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	20UMA3CC7		ADVANCED CALCULUS			5			5	
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓		✓
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3			✓	✓		✓	✓	✓		✓
CO4	✓	✓	✓	✓	✓			✓	✓	
CO5		✓	✓		✓	✓	✓		✓	✓
Number of matches (✓) = 34, Relationship: Moderate										

**Prepared by :**

1. Mr. S. Masoothu
2. Ms. Affrose Begum

**Checked by :**

1. Afya Farhana

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4CC8	Core – VIII	PDE AND FOURIER SERIES	3	2	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Discuss the basic concepts in Partial Differential Equation of first order and Classification of integrals
2. Solve the first order PDE using standard forms I, II, III, IV and Charpit's method.
3. Discuss and solve the Partial Differential equations of higher orders.
4. Define the concept of Fourier series and find the Fourier co-efficients for different functions.
5. Discuss the half range Fourier series and change of intervals by illustrating some examples.

### Unit I

**9 hours**

Partial Differential Equations: Elimination of arbitrary constants-Elimination of arbitrary functions – Different integrals of PDE – Solution of PDE in some simple cases- Lagrange's method of solving the linear equation.

### Unit II

**9 hours**

Standard types of first order PDE I, II, III and IV (Clairaut's form) –Equations reducible to the standard forms-Charpit's method.

### Unit III

**9 hours**

Partial Differential equations of higher orders: A simple case of the linear PDE with constant coefficients- The general homogeneous linear equation-The homogeneous equations with constant coefficients-Solution of homogeneous equation  $f(D, D')z = 0$  second method- Case of the auxiliary equation having repeated roots, The particular integral.

### Unit IV

**9 hours**

Fourier series: Definition of Fourier series -Finding Fourier expansion of a periodic function with period  $2\pi$  -#Odd and Even functions#

### Unit V

**9 hours**

Half range Fourier series –Development in cosine and sine series-Change of interval.

**# Self-study portion.**

### Text Book:

1. T.K Manicavachagom Pillay and S. Narayanan, Calculus Volume - III, S. Viswanathan Publishers Pvt., Ltd. (2019).
2. Dr. M.K. Venkataraman, Engineering Mathematics Volume-III B, The National Publishing Company, 13<sup>th</sup> edition, (1998).

<b>UNIT I</b>	Chapter 4	Sections 1 –4and 6	(TB- 1)
<b>UNIT II</b>	Chapter 4	Sections 5,7	(TB- 1)
<b>UNIT III</b>	Chapter II	Sections 13-19	(T.B-2)
<b>UNIT IV</b>	Chapter 6	Sections 1, 2, 3	(T.B-1)
<b>UNIT V</b>	Chapter 6	Sections 4,5,6	(T.B-1)

**Books for Reference**

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	20UMA3CC8		PDE AND FOURIER SERIES			3			2	
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓	✓	✓	✓	
CO2	✓			✓	✓	✓		✓		✓
CO3	✓	✓	✓	✓		✓	✓		✓	✓
CO4	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO5	✓		✓	✓	✓		✓	✓		✓
Number of matches (✓) = 38, Relationship: Moderate										

**Prepared by:**

1. N. Mohamed Thoiyab
2. M.S. Afya Farhana

**Checked by:**

1. Affrose Begum

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4AC7	Allied – VII	MATHEMATICAL STATISTICS - III	4	3	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Interpret the different types of correlation and regression with examples.
2. Demonstrate the give examples for sampling parameter and significance
3. Discuss the Application of  $\chi^2$  – distribution and  $\chi^2$  -test for populations
4. Determine the concept of Students t-distribution with illustrate the examples
5. Analyze the application of F-distribution

### UNIT I

**12 hours**

Bivariate distribution, Correlation, Scatter diagram, Pearson's Coefficient of Correlation, Properties, Rank correlation, Regression - Lines of Regression, #Regression Coefficient and its properties# - Simple Problems.

### UNIT II

**12 hours**

Sampling Introduction; Types of sampling parameter and statistic; Sampling distribution Standard Error; Tests of significance; Null Hypothesis. Test for single proportion; Test for difference of proportions; Test of significance of single mean; Test of significance of Difference of means.

### UNIT II

**12 hours**

Chi-Square variate Definition; Application of  $\chi^2$  - dist;  $\chi^2$  -test for pop. variance; and independence of attributes.

### UNIT IV

**12 hours**

Students t definition; Application of t-distribution test for single mean; Difference of means; test for corr. Coefficient.

### UNIT V

**12 hours**

F-Statistic def; Application of F-distribution; F-test for equality of pop. Variance.

### ## Self-study portion.

#### Text Book:

S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand publication, Third Edition, Reprint 2010.

UNIT I	Sections 10.1, 10.2, 10.3, 10.6, 10.7, 10.7.1, 10.7.3, 10.7.4
UNIT II	Sections 12.1 to 12.5, 12.9.1, 12.9.2, 12.13, 12.14
UNIT III	Sections 13.1, 13.5.1 - 13.5.3
UNIT IV	Sections 14.2, 14.2.5- 14.2.8
UNIT V	Sections 14.3, 14.3.1, 14.3.2

**Books for Reference:**

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).
2. P.R.Vittal, Mathematical Statistics, Margham Publishers, Chennai (2002).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
IV	20UMA4AC7	MATHEMATICAL STATISTICS - III				4	3			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓	✓		✓	✓		✓
CO2	✓	✓		✓		✓		✓		✓
CO3		✓	✓	✓		✓			✓	✓
CO4	✓	✓			✓	✓	✓	✓	✓	
CO5	✓		✓	✓	✓		✓		✓	✓
Number of matches (✓) = 33, Relationship: Moderate										

**Prepared by:**

1. Dr.A. Prasanna
2. Dr.M.Mohamed Althaf

**Checked by:**

Dr.R.Jahir Hussain

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4AC8P	Allied – VIII	Statistical Lab using R and SPSS	4	2	100	20	80

### **List of Practical's:**

1. Mean, Standard deviation, Variance.
2. Bar diagram, Line diagram, Pie chart and Histogram.
3. Co efficient of correlation.
4. Regression equation of X on Y.
5. Regression equation of Y on X.
6. Application of t-test for one sample problem.
7. Application of t-test for two sample problems.
8. Application of t-test for testing the significance of Correlation Coefficient.
9. One-tailed and Two-tailed tests.
10. Application of analysis of variance.

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4GE2	Generic Elective – II#	REASONING ABILITY	2	2	100	-	100

#### **UNIT I**

**6 hours**

Number Series- Alphabet Series – Alpha – Numeric Series, Analogy- Completing the Analogous Pair- Direct Analogy, Classification.

#### **UNIT II**

**6 hours**

Coding – Decoding – Letter Coding - Direct letter Coding- Number/Symbol Coding –Substitution – Deciphering Message word codes – Deciphering Number and symbol codes, Blood Relations.

#### **UNIT III**

**6 hours**

Puzzle Test- Classification Type- Seating Arrangements- Comparison Type – Sequential order- Selection Based on Given Conditions- Family Based Puzzles.

#### **UNIT IV**

**6 hours**

Sequential Output Tracing. Direction Sense Test

#### **UNIT V**

**6 hours**

Logical Venn Diagrams, Logical Deduction – Two-Premise Arguments.

#### **Text Books:**

Dr. R.S. Aggarwal , Verbal & Non-Verbal Reasoning, Revised Edition, S. Chand and Company Ltd,(2008).

**UNIT I** Chapters 1 to 3 Section I

**UNIT II** Chapters 4 and 5 Section I

**UNIT III** Chapter 6 Section I

**UNIT IV** Chapters 7 and 8 Section I

**UNIT V** Chapter 9 Section I and Chapter 1 Section II

#### **Books for Reference:**

1. R. V. Praveen, Quantitative Aptitude and Reasoning, PHI Private Limited, (2012).
2. Edgar Thorpe, Course in Mental Ability and Quantitative Aptitude, 3rd Edition, Mc Graw Hill Education,(2012).

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3AC5:2	Allied – V	Differential and Integral Calculus (For Physics)	4	3	100	25	75

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Examine methods for Higher Derivatives with illustrate the examples.
2. Demonstrate and discuss Jacobian – Curvature with examples.
3. Apply domain knowledge for Integration by parts - Reduction formulae .
4. Recall and illustrate the examples of Multiple Integrals.
5. Study of Application of multiple integrals with suitable examples.

### UNIT I

**12 hours**

Higher Derivatives: The nth derivative - Standard results - Trigonometrical transformations - Formation of equations involving derivatives - Leibnitz formula for the nth derivative of a product (Statement only) - Related problems.

### UNIT II

**12 hours**

Jacobian – Curvature: Circle, radius and centre of curvature – Cartesian formula for the Radius of Curvature – The Coordinates of the Center of Curvature.

### UNIT III

**12 hours**

Properties of definite integrals – Integration by parts - Reduction formulae  $\int x^n e^{ax}$ ,  $\int \sin^n x$ ,  $\int \cos^n x$ , and  $\int \sin^m x \cos^n x$  - Related problems.

### UNIT IV

**12 hours**

Multiple Integral: Definition of the double integral – Evaluation of the double integral – #Areas of curved Surface#.

### UNIT V

**12 hours**

Application of multiple integrals – Volume of solids of revolution – volumes of solids as double integrals – Volume as a triple integral.

# ..... # **Self-study portion**

### Text Book:

1. S.Narayanan, R.Hanumantha Rao and T.K.Manicavachagom Pillay, Ancillary Mathematics Volume - I, S.Viswanathan Publishers Pvt. Ltd Revised Edition (2007).
2. S.Narayanan, R.Hanumantha Rao and T.K.Manicavachagom Pillay, Ancillary Mathematics Volume - II, S.Viswanathan Publishers Pvt. Ltd Revised Edition (2007).

### UNIT I

Chapter VI

Sections 6.1

**T.B.1**

### UNIT II

Chapter VI

Sections 6.2, 6.4

**T.B.1**

### UNIT III

Chapter I

Sections 11, 12, 13.1-13.5

**T.B.2**

### UNIT IV

Chapter III

Sections 1-3

**T.B.2**

### UNIT V

Chapter III

Sections 4.1 – 5.2, 5.4

**T.B.2**

**Books for Reference:**

1. T.K.Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).
2. T.K.Manicavachagom Pillay and Others, Calculus Volume-II, S. Viswanathan Publishers Pvt.Ltd. (2004).

**Web Reference:**

<https://nptel.ac.in/courses/111/104/111104125/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
III	20UMA3AC5:2	Differential and Integral Calculus (For Physics)				4	3			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓	✓	
CO2	✓		✓		✓	✓		✓	✓	
CO3	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO4		✓	✓		✓	✓	✓		✓	
CO5	✓	✓		✓		✓		✓		✓
Number of matches (✓) = 34, Relationship: Moderate										

**Prepared by:**

1. Dr. V. Krishnan
2. Ms. B. Shafina Banu

**Checked by:**

1. Sharmila Banu

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3AC6:2	Allied – VI	ALGEBRA and TRIGONOMETRY (For Physics)	3	2	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recall the basic concept of binomial series and exponential series with illustrate the examples.
2. Apply domain knowledge for Relation between the coefficients and the roots of an algebraic equation with illustrate the examples.
3. Determine the concepts of Eigen values and Eigen vectors.
4. Examine Expansions of  $\cos n\theta$  and  $\sin n\theta$ .
5. Discuss about Hyperbolic functions.

### UNIT I

**9 hours**

Algebra: Binomial Series – Exponential Series.

### UNIT II

**9 hours**

Theory of equations: #Nature of roots# – Relation between the coefficients and the roots of an algebraic equation – Transformation of equations – Reciprocal equations.

### UNIT III

**9 hours**

Matrices: #Various types of Matrices# - Rank of a Matrix - Eigen values and Eigen vectors- Verification of Cayley-Hamilton theorem.

### UNIT IV

**9 hours**

Trigonometry: Expansions of  $\cos n\theta$  and  $\sin n\theta$  – Powers of sines and cosines of  $\theta$  in terms of functions of multiple of  $\theta$ .

### UNIT V

**9 hours**

Hyperbolic functions.

**## Self-study portion.**

### Text Book:

S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandaswamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).

**UNIT I** Chapter 1 Sections 1.2 – 1.3

**UNIT II** Chapter 2 Sections 2.1– 2.4

**UNIT III** Chapter 3 Sections 3.1, 3.2, 3.4.

**UNIT IV** Chapter 5 Sections 5.1, 5.2

**UNIT V** Chapter 5 Section 5.4.

### Books for Reference:

1. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).
2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours		Credits		
III	20UMA3AC6:2		ALGEBRA and TRIGONOMETRY (For Physics)			3		2		
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓		✓
CO2	✓	✓	✓			✓	✓	✓	✓	
CO3	✓			✓	✓	✓		✓		✓
CO4		✓	✓			✓	✓		✓	
CO5	✓	✓	✓	✓	✓			✓	✓	✓
Number of matches (✓) =33, Relationship: Moderate										

**Prepared by:**

1. Dr. M.Mohamed Althaf
2. Ms. Z.Sirajunisha

**Checked by:**

1. Dr. M.A.Rifayath Ali

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4AC7:2	Allied – VII	<b>DIFFERENTIAL EQUATIONS</b> (For Physics)	4	3	100	25	75

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Apply domain knowledge for solving first order linear differential equations.
2. Discuss and solve the linear differential equations with constant coefficients with examples.
3. Show differentials of partial differential equations and Lagrange's equations with illustrate the examples.
4. Investigate Laplace transform of periodic functions and some general theorems with examples.
5. Determine results under inverse transforms of functions with illustrative examples and solve differential equations with constant co-efficient.

### UNIT I

**12 hours**

Differential Equations of the first order: Definitions – Solution of Differential Equations – Formation of differential equations – Equations of the first order and the first degree – variable separable – Homogenous equations – Non homogenous equations of the first degree in  $x$  and  $y$  – linear equation.

### UNIT II

**12 hours**

Linear Differential Equations with Constant Coefficients: The operator  $D$  and  $D^{-1}$  – particular integral – Special methods of finding P.I – Forced Vibration – Equations reducible to the linear homogeneous equation.

### UNIT III

**12 hours**

Partial Differential Equations: Derivation of partial differential equations – Differentials of partial differential equations – Solution of partial differential equation in some simple cases – Some standard types of first order equations – Lagrange's Equations.

### UNIT IV

**12 hours**

Laplace Transforms: Definitions – Laplace transform of periodic functions – Some General Theorems.

### UNIT V

**12 hours**

The inverse transforms: Results under inverse transforms of functions – Solving ordinary differential equations with constant coefficients using Laplace transforms.

### Text Book:

S.Narayanan and T.K.Manicavachagompillay, Calculus, Volume – III, S.Viswanathan Publishers Pvt. Ltd., Revised Edition (2008).

<b>UNIT I</b>	Chapter-1	Sections 1, 2.1-2.4.
<b>UNIT II</b>	Chapter-2	Sections 1 to 4 Sections 6 to 8
<b>UNIT III</b>	Chapter-4	Sections 1 to 6
<b>UNIT IV</b>	Chapter-5	Sections 1 to 5
<b>UNIT V</b>	Chapter-5	Sections 6 to 8

### Books for Reference

1. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House(2008).
2. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publication Company.

### Web Sources

- <https://www.classcentral.com/course/swayam-ordinary-and-partial-differential-equations-and-applications-17718>.
- <https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ma10/>.
- <https://nptel.ac.in/courses/111/105/111105093/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
IV	20UMA4AC7:2	DIFFERENTIAL EQUATIONS (For Physics)				4	3			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓	✓		✓		✓	✓
CO2		✓	✓		✓		✓	✓	✓	
CO3	✓			✓		✓		✓		✓
CO4	✓	✓		✓	✓				✓	
CO5	✓		✓	✓		✓	✓	✓	✓	✓
Number of matches (✓) =31, Relationship: Moderate										

### Prepared by:

1. T.Shiek Pareeth
2. S.Hairun Bee

### Checked by :

1.Dr.D.Dhamodharan

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4AC8:2	Allied – VIII	VECTOR CALCULUS AND FOURIER SERIES (For Physics)	4	2	100	25	75

#### Course Outcomes:

At the end of the Course, Students will be able to:

1. Recognize and Recall the basic concept of vector and operators with examples.
2. Show and illustrate the line, volume and surface integral.
3. Find the solution of the simple problem using existing theorems.
4. Determine the Fourier series with examples.
5. Describe and discuss about the sine and cosine series in change of interval.

#### UNIT I

12 hours

Vector Analysis: Level Surfaces – The vector differential operator – Gradient – Direction and Magnitude of gradient – Divergence and curl – operators involving  $\nabla$  twice.

#### UNIT II

12 hours

Line integral – Theorem under line integral – volume integral – surface integral.

#### UNIT III

12 hours

Gauss Divergence Theorem (Statement only) – Stokes Theorem (Statement only) - Simple problems.

#### UNIT IV

12 hours

Fourier Series: Even and Odd Functions – Half Range Fourier Series – Development in Cosine series.

#### UNIT V

12 hours

Development in Sine Series – change of interval – combination of series.

#### Text Book:

S.Narayanan, R. Hanumantha Rao and T.K.Manikavachagompillay, P. Kandasamy, Ancillary Mathematics, Volume – II, S.Viswanathan publishers Pvt. Ltd., Revised Edition (2007).

**UNIT I** Chapter-8 Sections 15 to 20, 22

**UNIT II** Chapter-8 Sections 1 to 5

**UNIT III** Chapter-8 Sections 6, 9

**UNIT IV** Chapter-2 Sections 1 to 4, 5.1

**UNIT V** Chapter-2 Sections 5.2, 6, 7

**Books for Reference:**

1. S.Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House(2008).
2. A. H. Siddiqi & P.H. Manchanda, A first course in Differential Equations with applications, Macmillan Publishers India Limited, 2006.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours			Credits	
IV	20UMA4AC8:2	VECTOR CALCULUS AND FOURIER SERIES (For Physics)				4			2	
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓		
CO2	✓	✓		✓	✓	✓		✓	✓	
CO3	✓	✓		✓	✓	✓		✓		✓
CO4	✓	✓			✓	✓	✓	✓		✓
CO5		✓	✓		✓	✓	✓		✓	✓
Number of matches (✓) =34, Relationship : Moderate										

**Prepared By:**

1. Dr.U. Abuthahir
2. Ms.A.Reigana Begum

**Checked By:**

1.Ms.Z.Sirajunisha

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3AC5:3	Allied – V	DIFFERENTIAL CALCULUS (FOR CHEMISTRY)	4	3	100	25	75

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Find the  $n^{\text{th}}$  derivatives of a function and apply the Leibnitz's theorem for finding  $n^{\text{th}}$  derivative of product of two functions.
2. Discuss the partial derivatives of a function of functions depending on two independent variables and to understand the concepts of homogeneous function, Euler's theorem, total differentiation and implicit functions.
3. Solve maxima and minima for a function of one, two variables.
4. Explain the concept of curvature of a curve and to find the radius and centre of curvature of a given curve.
5. Understand the concept of evolute, involute and to find radius of curvature using polar co-ordinates and forming pedal equation of a curve.

### Unit I

**12 hours**

Successive Differentiation: Then  $n^{\text{th}}$  derivatives of Standard result – Trigonometrical transformation of functions - # Formation of equations involving derivatives # - Leibnitz formula for the  $n^{\text{th}}$  derivative of a product (Statement only) - Related problems.

### Unit II

**12 hours**

Partial Differentiation: Successive partial derivatives – Function of function rule - # Total differential coefficient and special case # – implicit functions - Homogeneous functions - Partial derivatives of a function of two functions.

### Unit III

**12 hours**

Maxima and Minima of a function of one variable - Maxima and Minima of function of two variables - Lagrange's Method of undetermined Multipliers.

### Unit IV

**12 hours**

Curvature: Circle, Radius and Center of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Center of Curvature.

### Unit V

**12 hours**

Evolute and Involute – Radius of curvature when the curve is given in polar co-ordinates –  $p$ - $r$  equation.

# # Self-study portion.

**Note:** Theoretical proof not expected.

### Text Book:

I. T.K. Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).

**UNIT I** Chapter III: Sections 1.1 – 1.6, 2.1, 2.2 (Section 2.1: statement only  
Section 2.2: problems only)

**UNIT II** Chapter VIII: Sections 1.1 – 1.7

**UNIT III** Chapter V: Sections 1.2, 1.3, 1.5 (Section 1.2 and 1.3: Theorems statement only,  
Section 1.5: Working Rules and problems only)

Chapter VIII: Sections 4, 5

**UNIT IV** Chapter X: Sections 2.1 – 2.4

**UNIT V** Chapter X: Sections 2.5 – 2.8

**Books for Reference:**

- 1.A.Abdul Rasheed, Allied Mathematics,Tata McGraw Hill Education (2006)
2. S.ArumugamandA.ThangapandiIsaac,Calculus,NewGammaPublishingHouse(2008).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours			Credits	
III	20UMA3AC5:3	DIFFERENTIAL CALCULUS (FOR CHEMISTRY)				4			3	
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓	✓	✓	✓	
CO2	✓		✓	✓	✓	✓		✓		✓
CO3	✓	✓		✓		✓	✓		✓	✓
CO4	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO5	✓		✓	✓	✓		✓	✓		✓
Number of matches (✓) =38, Relationship : High										

**Prepared by:**

1. N. Mohamed Thoiyab
2. A. Fathima Begam

**Checked by:**

- 1.Mr.T.Shiek Pareeth

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UMA3AC6:3	Allied – VI	ALGEBRA and TRIGONOMETRY (For Chemistry)	3	2	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recall the basic concept of binomial series and exponential series with illustrate the examples.
2. Apply domain knowledge for Relation between the coefficients and the roots of an algebraic equation with illustrate the examples.
3. Determine the concepts of Eigen values and Eigen vectors.
4. Examine Expansions of  $\cos n\theta$  and  $\sin n\theta$ .
5. Discuss about Hyperbolic functions.

### UNIT I

**9 hours**

Algebra: Binomial Series – Exponential Series.

### UNIT II

**9 hours**

Theory of equations: #Nature of roots# – Relation between the coefficients and the roots of an algebraic equation – Transformation of equations – Reciprocal equations.

### UNIT III

**9 hours**

Matrices: #Various types of Matrices# - Rank of a Matrix - Eigen values and Eigen vectors- Verification of Cayley-Hamilton theorem.

### UNIT IV

**9 hours**

Trigonometry: Expansions of  $\cos n\theta$  and  $\sin n\theta$  – Powers of sines and cosines of  $\theta$  in terms of functions of multiple of  $\theta$ .

### UNIT V

**9 hours**

Hyperbolic functions.

**## Self-study portion.**

### Text Book:

S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandaswamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).

<b>UNIT I</b>	Chapter 1	Sections 1.2 – 1.3
<b>UNIT II</b>	Chapter 2	Sections 2.1– 2.4
<b>UNIT III</b>	Chapter 3	Sections 3.1, 3.2, 3.4.
<b>UNIT IV</b>	Chapter 5	Sections 5.1, 5.2
<b>UNIT V</b>	Chapter 5	Section 5.4.

### Books for Reference:

1. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).
2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
III	20UMA3AC6:3	ALGEBRA and TRIGONOMETRY (For Chemistry)				3	2			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓	✓		✓
CO2	✓	✓	✓			✓	✓	✓	✓	
CO3	✓			✓	✓	✓		✓		✓
CO4		✓	✓			✓	✓		✓	
CO5	✓	✓	✓	✓	✓			✓	✓	✓
Number of matches (✓) =33, Relationship: Moderate										

**Prepared by:**

1. Dr. M.Mohamed Althaf
2. Ms. Z.Sirajunisha

**Checked by:**

1. Dr. M.A.Rifayath Ali

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4AC7:3	Allied – VII	ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (For Chemistry)	4	3	100	25	75

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Recall and understand the concept of exact differential equations.
2. Discuss the equations of the first order but of higher degree and homogeneous equations in x and y with illustrative examples.
3. Show linear equations with constant coefficients and particular integrals with examples.
4. Apply domain knowledge for solving equations reducible to the linear equations and method of variation of parameters.
5. Determine Lagrange's method of solving the linear equation with illustrative examples.

### UNIT I

**12 hours**

Linear equation –Bernoulli's equation –Exact differential equations.

### UNIT II

**12 hours**

Equations of the first order but of higher degree - Equations solvable for  $dy/dx$  Equations solvable for  $y$  - #Equations solvable for  $x$  – Clairaut's form – Equations that do not contain  $x$  explicitly - Equations that do not contain  $y$  explicitly - Homogeneous equations in  $x$  and  $y$ .

### UNIT III

**12 hours**

Linear Equations with constant coefficients - The operator  $D$  - Complementary function of a linear equation with constant coefficients –Particular integrals.

### UNIT IV

**12 hours**

Linear equations with variable coefficients –Equations reducible to the linear equations –Variation of parameters.

### UNIT V

**12 hours**

Partial Differential Equations of the first order - Classification of integrals - Derivation of PDE by elimination of constants and functions - Lagrange's method of solving the linear equation -Special methods -Standard forms I, II, #III and IV (Clairant's form) #.

**Self-study portion # #.**

### Text Book:

S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, S. Viswanathan Publishers Pvt. Ltd., Ninth edition (1996).

**UNIT I** Chapter II Sections 4, 5, 6.1 –6.4

**UNIT II** Chapter IV Sections 1 –4

**UNIT III** Chapter V Sections 1 –4

**UNIT IV** Chapter V Sections 5, 6

Chapter VIII Section 4

**UNIT V** Chapter XII Sections 1 –5

### Books for Reference:

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).

## Web sources

<https://nptel.ac.in/courses/111/105/111105093/>

<https://nptel.ac.in/courses/111/107/111107111/https://nptel.ac.in/courses/122/107/122107037/>

<https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ma10/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
IV	20UMA4AC7:3	ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (For Chemistry)				4	3			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓		✓	✓		✓
CO2		✓	✓		✓	✓	✓	✓	✓	
CO3	✓			✓		✓			✓	✓
CO4	✓	✓			✓				✓	
CO5			✓	✓		✓	✓	✓		✓
Number of matches (✓) =30, Relationship: Moderate										

### Prepared by:

1. T.Shiek Pareeth
2. C.Vijayalakshmi

### Checked by:

1. Dr.V.Krishnan

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UMA4AC8:3	Allied – VIII	Statistics & Vector Calculus (for Chemistry)	4	2	100	25	75

### Course Outcomes:

At the end of the Course, Students will be able to:

1. Apply domain knowledge for Measures of Central Tendency
2. Recall and illustrate the examples of Measures of Central Tendency
3. Demonstrate and discuss Measures of Dispersion
4. Determine and study of bivariate distributions with examples.
5. Examine methods for the vector differential operator with examples

### UNIT I

**12 hours**

Measures of central tendency- Arithmetic Mean - Properties of Arithmetic Mean - Weighted mean – Median- #Merits and Demerits of Mean, Median#.

### UNIT II

**12hours**

Mode - Geometric mean - Harmonic mean. Graphical Location of the Partition values.  
#Merits and Demerits of Mode, Geometric Mean and Harmonic Mean#.

### UNIT III

**12hours**

Dispersion-characteristics for ideal measure of dispersion - Measures of Dispersion - Range - Q.D - M.D - S.D, coefficient of dispersion - #Coefficient of variation# - Simple problems.

### UNIT IV

**12hours**

Correlation – Bivariate distribution, correlation – scatter diagram – Karl- Pearson's coefficient of correlation – Rank correlation- Regression - Properties of correlation and regression coefficients. (Numerical Problems only)

### UNIT V

**12hours**

Vector Calculus: The vector differential operator-Gradient- Direction and Magnitude of gradient- Divergence and curl- Related problems.

# ..... # **Self-study portion**

### Text Book:

1. S.C.Gupta&V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons, Third Edition, Reprint 2010.
2. S.Narayanan, R.Hanumantha Rao , T.K. Manicachagom Pillay and P. Kandasamy, Ancillary Mathematics, Volume II, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2008).

<b>UNIT I</b>	Chapter 2	Sections 2.3 - 2.6	<b>TB-1</b>
<b>UNIT II</b>	Chapter 2	Sections 2.7-2.9.1, 2.11.1	<b>TB-1</b>
<b>UNIT III</b>	Chapter 3	Sections 3.1-3.7, 3.7.3, 3.8	<b>TB-1</b>
<b>UNIT IV</b>	Chapter 10	Sections 10.1 to 10.3, 10.6, 10.	<b>TB-1</b>
<b>UNIT V</b>	Chapter 8	Sections 16-20	<b>TB-2</b>

### Books for References:

1. Murray R. Spiegel, John Jschiller, R. Alu Srinivasan, Probability and Statistics, Third Edition, Shaum's Outline Series (2010).
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).
3. M.L, Khanna, Vector calculus, Jai Prakash Nath and Co., Eighth Edition (1986).

**Web Reference:**

1. <https://nptel.ac.in/courses/111/106/111106112/>
2. <https://nptel.ac.in/courses/108/106/108106152/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours			Credits	
IV	20UMA4AC8:3	Statistics & Vector Calculus (for Chemistry)				4			2	
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓		✓		✓
CO2	✓	✓		✓	✓	✓		✓		
CO3	✓		✓	✓	✓		✓		✓	✓
CO4	✓	✓	✓			✓	✓	✓	✓	
CO5		✓	✓	✓	✓		✓		✓	✓
Number of matches (✓) =34, Relationship: Moderate										

**Prepared by:**

1. Dr. P. Muruganantham
2. Dr. V. Krishnan

**Checked by:**

1.Dr. U.Abuthahir

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5CC9	Core – IX	MECHANICS	6	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Apply domain knowledge for finding the resultant of forces.
2. Evaluate the equilibrium of a rigid body under coplanar forces.
3. Demonstrate the equilibrium of a hanging string.
4. Discuss the kinematics of Projectile projected on the surface.
5. Classify impact of two smooth spheres.

### UNIT I

**18 hours**

Force: Newton's Laws of motion –Resultant of two forces on a particle-Equilibrium of a particle: Equilibrium of a particle under three forces.

### UNIT II

**18 hours**

Forces on a rigid body: Moment of force - Parallel forces – Forces along the sides of a triangle - Couples – #Resultant of several coplanar forces#. Equilibrium of a rigid body under three coplanar forces –Cotangent formulae.

### UNIT III

**18 hours**

Types of forces - A specific reduction of forces: Problems involving frictional forces – Hanging Strings: Equilibrium of a uniform homogeneous string–#Suspension bridge#.

### UNIT IV

**18 hours**

Kinematics: Velocity – Projectiles - Forces on projectile –Projectile projected on an inclined plane.

### UNIT V

**18 hours**

Impact: Impact of sphere–Impact of two smooth spheres –Impact of a smooth sphere on a plane – Direct Impact of a smooth sphere on a plane - Oblique Impact of a smooth sphere on a plane - Oblique Impact of two smooth spheres.

### # # Self-study portion.

### Text Book:

P. Duraipandian, LaxmiDuraipandian and MuthamizhJayapragasam, Mechanics, S.Chand& Company Ltd, 2018.

### UNIT I

Chapter 2 Sections 2.1.1, 2.2

Chapter 3 Sections 3.1

### UNIT II

Chapter 4 Sections 4.1,4.4-4.7(Except 4.7.1, 4.7.2), 4.9

### UNIT III

Chapter 2 Sections 2.1.2

Chapter 5 Sections 5.2(Except 5.2.1)

Chapter 9 Sections 9.1, 9.2

### UNIT IV

Chapter 1 Sections 1.2

Chapter 13 Sections 13.1 & 13.2

### UNIT V

Chapter 14 Sections 14.2 to 14.5

### Books for Reference:

1. M.K.Venkataraman, Statics, Agasthiyar Publications, 2002.
2. M.K.Venkataraman, Dynamics, Agasthiyar Publications, 2002.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
V	20UMA5CC9		MECHANICS			6		5		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓		✓		✓		✓		✓
CO3		✓	✓	✓		✓		✓	✓	✓
CO4	✓	✓	✓		✓	✓	✓	✓	✓	
CO5	✓		✓	✓	✓		✓		✓	✓
Number of Matches= 38, Relationship : HIGH										

**Prepared by :**

Dr.S. Mohamed Yusuff Ansari

**Checked by :**

M. SabikaFurvin

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5CC10	Core – X	REAL ANALYSIS	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Demonstrate an understanding of the functions continuous on a metric space.
2. Discuss the discontinuous on the real line.
3. Give the definition of concepts related to metric space such as uniformly continuity, compactness and completeness.
4. Define and recognize the Riemann integral.
5. Give the essence of the proof of fundamental theorem of calculus.

### UNIT I

**15 hours**

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – #Open sets#.

### UNIT II

**15 hours**

#Closed sets# – Discontinuous functions on the real line – More about open sets – Connected sets – Bounded sets and totally bounded sets.

### UNIT III

**15 hours**

Complete metric spaces – Compact metric spaces – Continuous functions on a compact metric spaces – Continuity of inverse functions – Uniform continuity.

### UNIT IV

**15 hours**

Sets of measure zero – Definition of the Riemann integral – Existence of the Riemann integral – Properties of Riemann integral.

### UNIT V

**15 hours**

Derivatives – Rolle's theorem – Law of mean – Fundamental theorems of calculus.

**## Self-study portion.**

### Text Book:

Richard R. Goldberg, Methods of Real Analysis, (Oxford and IBH Publishing Co.), Reprint 2019.

<b>UNIT I</b>	Chapter –V	Sections 5.1 –5.4
<b>UNIT II</b>	Chapter – V	Sections 5.5 and 5.6
	Chapter – VI	Sections 6.1 - 6.3
<b>UNIT III</b>	Chapter – VI	Sections 6.4 – 6.8
<b>UNIT IV</b>	Chapter – VII	Sections 7.1 – 7.4
<b>UNIT V</b>	Chapter - VII	Sections 7.5 and 7.8

### Books for Reference:

1. Principles of Real analysis, Third edition, Walter Rudin, Mc-Graw Hill international edition, 1976.
2. Elements of Real Analysis, Shanti Narayan, M.D. Raisinhhania, S. Chand & Company Ltd., Twelfth Revised Edition, 2011.
3. Real analysis, Volume I, K. Chandrasekhara Rao, K.S Narayan, S. Viswanathan Printers & Publishers Pvt. Ltd., 2008.
4. Modern Analysis, S. Arumugam, Issac, New Gamma Publishing House, 2012.

### Web Source

1. <https://youtu.be/8Uf8cRh57k8>
2. <https://youtu.be/fVzOEX6Stzc>
3. <https://youtu.be/lK3h9NSh-DI>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
V	20UMA5CC10		REAL ANALYSIS			5		5		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓			✓		✓	✓	✓
CO2	✓		✓	✓	✓	✓	✓	✓		✓
CO3	✓	✓	✓	✓			✓	✓	✓	
CO4	✓	✓		✓	✓	✓	✓	✓		✓
CO5	✓		✓		✓	✓			✓	✓
Number of Matches= 35, Relationship : High										

**Prepared by:**

Dr. M. Mohamed Althaf

**Checked by:**

Ms. R. Shahin

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5CC11	Core – XI	ALGEBRA	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Understand the concept of groups and its related subgroups.
2. Analyse the results to find the order of elements in permutation group.
3. Apply the concept of groups to create a new structure namely rings.
4. Creating new fields using ring namely field of quotients in an integral domain.
5. Evaluate a given subset of a ring to be either subring or ideal.

### UNIT I 15 hours

Group Theory- Groups – Subgroups – Counting Principle – Normal Subgroups

### UNIT II 15 hours

Homomorphisms – Automorphisms – Cayley's theorem – Permutation groups.

### UNIT III 15 hours

Ring Theory- Definition and examples of Rings – Some special classes of rings – Homomorphisms.

### UNIT IV 15 hours

Ideals and Quotient rings - More ideals and Quotient ideals – field of quotients of an integral domain.

### UNIT V 15 hours

Euclidean rings - A particular Euclidean ring – Polynomial Rings – Polynomials over the rational field.

### Text Book:

Topics in Algebra, Second Edition, I.N. Herstein, Wiley Student edition, 2019.

Unit I	Chapter 2	Sections 2.1 – 2.6
Unit II	Chapter 2	Sections 2.7 – 2.10
Unit III	Chapter 3	Sections 3.1 – 3.3
Unit IV	Chapter 3	Sections 3.4 – 3.6
Unit V	Chapter 3	Sections 3.7 – 3.10

### Books for Reference:

1. Modern Algebra, M.L. Santiago, Tata McGraw-Hill Publishing Co. Ltd, 2001.
2. S.G. Venkatachalapathy, Modern Algebra, Maragham Publications (2003).

### Web Link:

1. <https://nptel.ac.in/courses/111/106/111106137/>
2. <https://youtu.be/RNtgeBc3wyg>
3. <https://youtu.be/fchJe96mXXQ>
4. <https://youtu.be/ZCX49Jd3A38>
5. <https://youtu.be/3pl-Rzy7IDU>
6. <https://youtu.be/FXbnrsv4Z3g>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester	Code					Title of the Paper			Hours	Credits
V	20UMA5CC11					Algebra			5	5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√	√	√		√		√	√		√
CO2	√		√	√		√	√		√	√
CO3		√		√	√	√		√	√	
CO4	√	√	√		√		√	√		√
CO5	√	√		√	√	√	√	√	√	√
Number of Matches= 37, Relationship : HIGH										

**Prepared by :**

Dr. D. Dhamodharan

**Checked by :**

Ms. C. Vijayalakshmi

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5CC12	Core -XII	NUMERICAL METHODS	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Understand the nature of solution of algebraic and transcendental equations through different numerical methods.
2. Learn various interpolation methods and finite difference concepts.
3. Find out the numerical integration and differentiation through trapezoidal and Simpson's Rule.
4. Solve problems in linear system of equations through different Gaussian methods.
5. Solve ordinary differential equations through different numerical methods.

#### UNIT I

**15 hours**

Solution of Algebraic and Transcendental equation – Bisection Method - #Iteration Method# - Method of false position - Newton-Raphson Method.

#### UNIT II

**15 hours**

Interpolation: Finite differences – Forward differences - #Backward differences# - Central differences - Symbolic relations - Newton's formula for interpolation. Interpolation with unevenly spaced points – Lagrange's interpolation formula.

#### UNIT III

**15 hours**

Numerical differentiation and integration – Numerical differentiation (Excluding cubic spline Method), Maximum and Minimum values of a tabulated function) - Numerical integration -Trapezoidal Rule - Simpson's Rule.

#### UNIT IV

**15 hours**

Matrices and linear system of equation: Gaussian Elimination Method - Method of Factorization - Iterative Method –Gauss Jacobi- Gauss Jordan - Gauss Seidel Methods.

#### UNIT V

**15 hours**

Numerical solution of ordinary differential equations – Solution by Taylor series - Picard's method of successive approximations - Euler method - #Modified Euler Method#- Runge–Kutta Methods of second order and fourth order.

**## Self-study portion.**

### Text Book:

S.S. Sastry, Introductory Methods of Numerical Analysis, Fourth Edition (2009)

**UNIT I:** Chapter 2 Sections 2.1-2.5

**UNIT II:** Chapter 3 Sections 3.3, 3.6, 3.9.1

**UNIT III:** Chapter 5 Sections 5.1, 5.2(Excluding 5.2.1 and 5.2.2), 5.4, 5.4.1, 5.4.2

**UNIT IV:** Chapter 6 Sections 6.3.2-6.3.4, 6.4

**UNIT V:** Chapter 7 Sections 7.2 - 7.4, 7.4.2, 7.5.

### Books for Reference:

1.F.B. Hildebrand, Introduction to Numerical analysis, Second edition, Tata McgrawHill (1987).

2.A. Singaravelu, Numerical Methods, Meenachi Agency (2000)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
V	20UMA5CC12	NUMERICAL METHODS				5	5			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓		✓
CO2	✓		✓	✓	✓	✓	✓	✓		✓
CO3	✓		✓	✓	✓				✓	✓
CO4	✓		✓		✓	✓	✓	✓	✓	
CO5		✓	✓	✓			✓		✓	✓
Number of matches (✓) = 35,Relationship: High										

**Prepared by:**

Dr.P. Muruganantham

**Checked by:**

Ms. A. Fathima Begum

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5DE1A	DSE – I	GRAPH THEORY	5	4	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Demonstrate the knowledge of fundamental concepts in graph theory, including properties and characterization of graphs.
2. Use graphs for solving real life problems.
3. Find out degree sequence and connectivity in graph theory.
4. Distinguish between planar and non-planar graphs and solve problems.
5. Understand graph theory in coherent and matrix representation techniques.

### UNIT I

**15 hours**

Graph – #Applications of Graphs# – Finite and Infinite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graphs. Paths and Circuits: Isomorphism – Sub-graphs – Walks, Paths and Circuits – Connected and disconnected graphs – Euler graphs.

### UNIT II

**15 hours**

Operations on Graphs – More on Euler Graphs – Hamiltonian Paths and circuits - #Travelling Salesman Problem#. Trees and fundamental circuits: Trees – Properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree.

### UNIT III

**15 hours**

Spanning Trees – Fundamental circuits – #Finding all spanning trees of graph# – Spanning trees in a weighted graph - Cut sets and cut vertices: Cut sets – Properties of a cut set – All cut sets in a graph.

### UNIT IV

**15 hours**

Fundamental circuits and cut sets – Connectivity and Separability. Planar and dual graphs: Planar graphs – Kuratowski's two graphs – Representation of a planar graph.

### UNIT V

**15 hours**

Matrix Representation of graphs: Incidence Matrix – Circuit matrix – Fundamental circuit matrix and Rank of circuit matrix – #Cut set matrix#–Relationship among  $A_f$ ,  $B_f$  and  $C_f$ – Path matrix–adjacency matrix.

**## Self-study portion.**

### Text Books:

NarsinghDeo, Graph theory with application to Engineering and Computer Science, Dover Publications, New York (2016).

<b>UNIT I</b>	Chapter 1	Sections 1.1 – 1.5
	Chapter 2	Sections 2.1, 2.2, 2.4 – 2.6
<b>UNIT II</b>	Chapter 2	Sections 2.7 – 2.10
	Chapter 3	Sections 3.1 – 3.4
<b>UNIT III</b>	Chapter 3	Sections 3.7 – 3.10
	Chapter 4	Sections 4.1 – 4.3
<b>UNIT IV</b>	Chapter 4	Sections 4.4, 4.5
	Chapter 5	Sections 5.2 – 5.4
<b>UNIT V</b>	Chapter 7	Sections 7.1 – 7.4, 7.6 -7.9

### Books for Reference:

1. V.R. Kulli, College Graph Theory, Viswa International Publications, Gulbarga, India (2012).
2. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, Tata McGraw Hill Higher Education Private Limited, New Delhi, Eight reprint (2012).
3. Frank Harary, Graph Theory, Narosa Publishing House, New Delhi (Reprint 2001).

**Web Source:**

[https://www.youtube.com/results?search\\_query=nptel+graph+theory](https://www.youtube.com/results?search_query=nptel+graph+theory)  
<https://www.youtube.com/channel/UCfm1RidSZpKnqhaBhjLcalg/videos>  
<https://www.youtube.com/channel/UCj10vpqn1SaP12F4ZngeJbg>  
<https://www.youtube.com/channel/UCruU9Ib34BY42wLFjQKkX5g/featured>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester	Code		Title of the Paper			Hours		Credits		
V	20UMA5DE1A		GRAPH THEORY			5		4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓	✓	✓	✓		✓
CO2	✓		✓	✓			✓	✓		✓
CO3		✓	✓		✓	✓			✓	✓
CO4	✓	✓		✓		✓	✓	✓	✓	
CO5	✓		✓		✓		✓		✓	✓
Number of Matches= 33, Relationship : MODERATE										

**Prepared by :**

Dr. S. Ismail Mohideen  
 Dr. M.A. Rifayathali

**Checked by :**

Ms. Z. Sirajunisha

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5DE1B	DSE – I	COMBINATORICS	5	4	100	25	75

## Course Outcomes

At the end of the Course, Students will be able to:

1. Demonstrate a working knowledge of multisets and compositions, Apply the inclusion and exclusion principle.
2. Analyze the power series, generalized binomial coefficients, set up and solve a linear recursions relation.
3. Compute a generating function and apply them to combinatorial problems.
4. Recognize the cycle structure of permutations, solve counting permutations with respect to inversions.
5. Describe the Unimodality and Log-concavity, Apply the project property and the real zeros property.

### UNIT I

**15 hours**

Multisets and Compositions – Weak Compositions – Compositions - Set Partitions –Stirling Numbers of the Second Kind – Recurrence Relations for Stirling Numbers of the Second Kind – When the Number of Blocks Is Not Fixed - Partitions of Integers –Nonincreasing Finite Sequences of Integers – Ferrer’s Shapes and Their Applications – Euler’s Pentagonal Number Theorem - The inclusion - Exclusion Principle – Two Intersecting Sets – Three Intersecting Sets – Any Number of Intersecting Sets.

### UNIT II

**15 hours**

Power Series – Generalized Binomial Coefficients – Formal Power Series – Solving Recursions - Ordinary Generating Functions – Exponential Generating Functions.

### UNIT III

**15 hours**

Product of Generating Function – Ordinary Generating Functions – Exponential Generating Functions - Composition of Two Generating Functions – Ordinary Generating Functions – #Exponential Generating Functions#- A Different Type of Generating Function

### UNIT IV

**15 hours**

The cycle Structure of Permutations – Stirling Numbers of the First Kind –Permutations of a Given type - Cycle Structure and Exponential Generating Functions –Inversions – Counting Permutations with Respect to Inversions.

### UNIT V

**15 hours**

Unimodality – Log-Concavity – Log-Concavity Implies Unimodality – The Project Property – Injective Proofs - #The Real Zeros Property#.

**# # Self-study portion.**

## Text Book:

Miklos Bona, Introduction to Enumerative and Analytic Combinatorics, Second Edition 2015, University of Florida Gainesville, Florida, USA.

**UNIT I** Chapter 2 Sections 2.1-2.4

**UNIT II** Chapter 3 Sections 3.1-3.2

**UNIT III** Chapter 3 Sections 3.3-3.5

**UNIT IV** Chapter 4 Section 4.2-4.4

**UNIT V** Chapter 9 Section 9.1-9.3

## PDF Link:

<https://dokumen.pub/introduction-to-enumerative-and-analytic-combinatorics-2nbsped-9781482249095-148224909x.html>

## Books for Reference:

V.K. Balakrishnan – Theory and problems of combinatorics – Schaums outline series –TATA McGRAW HILL.

## Web Source

1. <https://youtu.be/FfO9ZaKRyDA>
2. [https://youtu.be/p8vIcmr\\_Pqo](https://youtu.be/p8vIcmr_Pqo)
3. [https://www.coursera.org/lecture/enumerative-combinatorics/formal-power-series-zYwip?utm\\_source=link&utm\\_medium=page\\_share&utm\\_content=vlp&utm\\_campaign=top\\_button](https://www.coursera.org/lecture/enumerative-combinatorics/formal-power-series-zYwip?utm_source=link&utm_medium=page_share&utm_content=vlp&utm_campaign=top_button)
4. [https://www.coursera.org/lecture/enumerative-combinatorics/generating-function-for-catalan-numbersXY7rw?utm\\_source=link&utm\\_medium=page\\_share&utm\\_content=vlp&utm\\_campaign=top\\_button](https://www.coursera.org/lecture/enumerative-combinatorics/generating-function-for-catalan-numbersXY7rw?utm_source=link&utm_medium=page_share&utm_content=vlp&utm_campaign=top_button)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
V	20UMA5DE1B		COMBINATORICS			5		4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2	✓	✓		✓		✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO4		✓	✓	✓			✓	✓	✓	✓
CO5	✓		✓	✓			✓	✓	✓	
Number of Matches= 37, Relationship : High										

**Prepared by :**  
Ms. A.Nafiunisha

**Checked by :**  
Ms. A. Reigana Begum

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
<b>V</b>	<b>20UMA5SE2AP</b>	<b>SEC – II</b>	<b>MAPLE - PRACTICAL</b>	<b>2</b>	<b>2</b>	<b>100</b>	<b>-</b>	<b>100</b>

### Course Outcomes

At the end of the Course, Students will be able to:

1. Using Maple as a scientific calculator.
2. Implement and illustrate 2 -D graphs and 3-D graphs.
3. Understanding of linear algebra, Differential equations and Statistics.
4. Evaluate, analyze and plot results using Maple.
5. Make use of theoretical concepts to solve problems and visualize the output.

### List of Practical - MAPLE

1. Write a program using mathematical constant.
2. Write a program using complex functions.
3. Write a program to find numerical solutions of nonlinear equations and systems.
4. Write a program for solving system of linear equations using Jacobi method.
5. Write a program using trigonometric and hyperbolic expressions.
6. Write a program finding eigen values and eigen vectors.
7. Write a program to creating and plotting 2D Graphs and 3D Graphs.
8. Write a program to analyze data using central tendency and measures of dispersion and distributions.
9. Write a program to find the laplace integral transforms for different functions.
10. Write a program to obtain the solution of the initial value problem.

### Text Book

Dr. Inna Shingareva&Dr. Carlos Lizárraga-Celaya , Maple and Mathematica: A Problem Solving Approach for Mathematics *Second Edition*, , Springer Wien New York,2009

### Relationship Matrix for Course Outcomes, Program Outcomes and Program Specific Outcomes :

Semester	Code		Title of the Paper				Hours		Credits	
V	20UMA5SE2AP		MAPLE - PRACTICAL				2		2	
Course Outcomes (COs)	Program Outcomes (POs)					Program Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√	√			√		√		√	√
CO2	√		√	√		√	√	√		
CO3		√		√	√			√		√
CO4			√		√	√	√	√	√	
CO5	√	√		√	√		√		√	√
Number of Matches= 30 , Relationship : Moderate										

### Prepared by:

Dr.M.Mohammed Jabarulla  
Mr. T.ShiekPareeth

### Checked by:

Ms. K.S. KanzulFathima

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
V	20UMA5SE2B	SEC-II	FUZZY SET	2	2	100	--	100

### Course Outcomes

At the end of the Course, Students will be able to:

1. Apply domain knowledge for fuzzy sets and its property.
2. Discuss the operations on fuzzy sets.
3. Understand the concept of fuzzy compliments
4. Demonstrate the concept of fuzzy graphs and fuzzy relations with examples
5. Evaluate a given Decision Making in Fuzzy Environment.

#### UNIT I

**6 hours**

Fuzzy Set Theory: Fuzzy sets - Fuzzy set: Definition - Different Types of Fuzzy sets - General Definitions and Properties of Fuzzy Sets.

#### UNIT II

**6 hours**

Other Important Operations - General Properties: Fuzzy Vs Crisp - Operations on Fuzzy Sets: Introduction - Some Important Theorems.

#### UNIT III

**6 hours**

Extension Principle for Fuzzy Sets - Fuzzy Compliments – Further Operations on Fuzzy Sets.

#### UNIT IV

**6 hours**

Fuzzy Relations and Fuzzy Graphs: Introduction - Projections and Cylindrical Fuzzy Relations- Composition - Properties of Min-Max Composition

#### UNIT V

**6 hours**

Decision Making in Fuzzy Environment: Introduction- Individual Decision Making – Multi Person Decision Making – Multi Criteria Decision Making.

### Text Book:

Sudhir K. Pundir and Rimple Pundir, Fuzzy sets and their Applications, A Pragati Prakashan Publishers, Meerut, 2019 ( 9<sup>th</sup> Edition)

**Unit I Chapter 1 Sections 1.16 – 1.19**

**Unit II Chapter 1 Sections 1.20 – 1.21 & Chapter 2 Sections 2.1 – 2.2**

**Unit III Chapter 2 Sections 2.3 – 2.5**

**Unit IV Chapter 4 Sections 4.1 – 4.4**

**Unit V Chapter 9 Sections 9.1 – 9.4**

### Books for Reference:

1. H. J. Zimmermann, Fuzzy Set Theory and its Applications, Springer Fourth Edition, 2001.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGrawHill Inc. New Delhi, 2004.
3. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic Theory and Applications, Prentice Hall of India, New Delhi, 1995.
4. M. Ganesh, Introduction to Fuzzy Sets and Fuzzy Logic, PHI Learning Pvt Ltd, new Delhi, 2009 (4<sup>th</sup> Edn)

**Web Link:**

1. <https://youtu.be/IZWTduVCrf8>
2. <https://youtu.be/tC3K8RLRIZc>
3. <https://youtu.be/Toal2MEC5x0>
4. <https://youtu.be/eELyd9zV47Q>
5. <https://youtu.be/JrRWdPvG7yk>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Out Comes:

Semester	Code		Title of the Paper			Hours		Credits		
V	20UMA5SE2B		Fuzzy Set			2		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		√		√	√	√		√	√	
CO2	√		√	√		√	√		√	√
CO3		√	√				√			
CO4	√	√		√	√	√	√	√		√
CO5	√	√		√	√	√	√	√	√	√
Number of Matches= 33 , Relationship : Moderate										

**Prepared by :**

Dr. H. Sheik Mujibur Rahman

**Checked by :**

Ms. J. SarthajBanu

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5SE3A	SEC –III	Mini Project using e- Mathematical Tool (Group)	2	2	100	-	100

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UMA5SE3BP	SEC –III	PAGEMAKER - PRACTICAL	2	2	100	-	100

### Course Outcomes

At the end of the Course, Students will be able to:

1. Understand the fundamentals of PageMaker.
2. Acquire knowledge on basic concepts of editing.
3. Work with graphics and formatting.
4. Create essential documents.
5. Obtain proficiency in electronic publishing.

### List of Practical:

1. Create a brochure for Seminar / Workshop.
2. Create a Visiting Card.
3. Create your Resume.
4. Create an advertisement for job in well-known form.
5. Create a Newspaper Report.
6. Create a document by importing Graphic Image from Clip Art.
7. Create a Wedding Card / New year Greeting Card.
8. Type a document using Story Editor.
9. Input a text from Word Document into a PageMaker document.
10. Create a document on Importance of Text Wrap, applying proper font size, tabs, alignment & indentation.
11. Importing and exporting, story editing and printing.
12. Creating book works, building booklets, completing the book.

### Web Reference:

<https://qdoc.tips/adobe-pagemaker-70-classroom-in-a-book-pdf-free.html>  
<http://ncsmindia.com/wp-content/uploads/2012/04/DTP4.pdf>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
V	20UMA5SE3BP			PAGEMAKER - PRACTICAL			2		2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓									✓
CO2	✓	✓		✓	✓	✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓		✓		✓	✓
CO4		✓	✓	✓			✓	✓	✓	✓
CO5		✓	✓	✓	✓		✓	✓	✓	✓
Number of Matches (✓)= 33, Relationship : Moderate										

**Prepared by :**

Dr. R. Jahir Hussain  
Dr. S. Shajitha Begum

**Checked by :**

Ms. A. ThagasinBanu

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UCN5EC1	EC – I	GENERAL INTELLIGENCE FOR COMPETITIVE EXAMINATIONS	-	4*	100	-	100

### Course Outcomes

At the end of the Course, Students will be able to:

1. Analyze the problems and to identify the appropriate blood relations.
2. Solve the arrangements, coding and symbols.
3. Demonstrate the concepts of Venn diagram, calendar and clocks with illustrations.
4. Solve the problems on configuration, cube and dices and also to understand the concepts of mirror, reflection and analogy.
5. Gain confidence to appear for career examinations.

### UNIT I

Blood relations – sense of direction – ranking and order

### UNIT II

Seating arrangements (linear and circular) –coding –decoding (names, characters and numbers)– Mathematical operations – symbols.

### UNIT III

Syllogism -Assumptions, inferences and conclusions, Venn diagram, calendar and clocks.

### UNIT IV

Configuration- fitting pieces, odd pieces– cube and dices (predicting colors or numbers on the faces of the objects)– Matrix (finding missing numbers or letters).

### UNIT V

Mirror and water reflection – paper cutting, folding and punching, – sequence of figures. Series – analogy – classification, missing character, odd pairs.

### Text Book:

R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning S. Chand & Company (2019).

### Books for Reference:

1. R.S Aggarwal, A modern Approach to verbal Reasoning, S. Chand Publishing (2018).
2. B.S. Sijwalii and InduSijwali, A New Approach to Reasoning Verbal & Non-Verbal January 2014

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours	Credits		
V	20UMA5EC1		GENERAL INTELLIGENCE FOR COMPETITIVE EXAMINATIONS				-	4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓			✓		✓	✓
CO2		✓	✓		✓	✓	✓	✓		
CO3	✓			✓	✓	✓	✓		✓	✓
CO4	✓		✓	✓			✓		✓	✓
CO5		✓	✓	✓		✓		✓	✓	
Number of Matches= 31, Relationship : Moderate										

**Prepared by :**

Mr. S. Masoothu

**Checked by :**

Ms. S. Hairun Bee

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6CC13	Core-XIII	LINEAR ALGEBRA	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Have knowledge of the concepts in vector space, linear span, linear dependence and independence
2. Construct an orthonormal basis for an inner product space by using the Gram-Schmidt process
3. Be exposed to concepts in linear transformations with examples.
4. Explain the concept of dual spaces with examples
5. Calculate the Characteristic values by using Cayley Hamilton theorem.

### UNIT I

**15 hours**

Vector spaces- subspaces- sum of subspaces- Quotient spaces- homomorphism of vector spaces- linear span- linear dependence and independence.

### UNIT II

**15 hours**

Inner product spaces – norm of a vector – orthogonality – orthonormal set.

### UNIT III

**15 hours**

Linear transformations – algebra of linear transformations – matrix of a linear transformation.

### UNIT IV

**15 hours**

Dual spaces- transpose of a linear transformations.

### UNIT V

**15 hours**

Characteristic polynomials - Characteristic polynomial of a linear operator – minimal polynomials – diagonalizable operators.

### Text book

Vijay K. Khanna and S. K. Bhambri, A course in Abstract Algebra, 4<sup>th</sup> Edition, Vikas Publishing house PVT LID, 2013.

<b>Unit I</b>	<b>Chapter 10 up to Linear dependence and independence. (Page numbers)</b>
<b>Unit II</b>	<b>Chapter 10 remaining</b>
<b>Unit III</b>	<b>Chapter 11 up to matrix of a linear transformation</b>
<b>Unit IV</b>	<b>Chapter 11 remaining</b>
<b>Unit V</b>	<b>Chapter 12 up to diagonalizable operators</b>

### Books for Reference:

1. V. Krishnamurthy, V.P. Mainra, I.L. Arora, Introduction to Linear Algebra, Affiliated East-west Press PVT LTD, 2000.
2. Lipschutz, Seymour, Lipson, Marc, Schaum's Outline of Linear Algebra, Sixth Edition, McGraw Hill Professional, 2018.

### Web link:

1. <https://nptel.ac.in/courses/111/106/111106051/>
2. <https://youtu.be/BxYHt2FlmqM>
3. <https://youtu.be/FL9ANdNTQus>
4. <https://youtu.be/9pqhfDyzbhw>
5. <https://youtu.be/H9p0-hlseh0>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code					Title of the Paper			Hours	Credits
VI	20UMA5CC13					Linear Algebra			5	5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		√	√	√	√		√	√		√
CO2	√	√		√	√	√	√		√	√
CO3	√		√		√	√		√	√	
CO4	√	√	√	√			√			√
CO5	√	√		√	√	√	√	√	√	√
Number of Matches= 37, Relationship : HIGH										

**Prepared by :**

Mr. S. Masoothu

Dr. D. Dhamodharan

**Checked by :**

Ms. M. Affrose Begum

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
VI	20UMA6CC14	Core-XIV	COMPLEX ANALYSIS	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recognize the concepts of Limits, Continuous and Differentiable functions with examples.
2. Apply the Domain knowledge of Conformal Mappings, Bilinear Transformation with examples.
3. Show and Illustrate Cauchy's Theorem and Cauchy's integral formula.
4. Discuss the expansions of Taylor's series, Laurent's Series and Singularities.
5. Describe residues and definite integrals.

### UNIT I

**15 hours**

Functions of complex variable – #Limits – Theorems on Limits# – Continuous functions – Differentiability – Cauchy – Riemann equations – Analytic functions- Harmonic functions.

### UNIT II

**15 hours**

Conformal Mapping – Elementary transformations – Bilinear transformations – Cross ratio – #Fixed points of Bilinear Transformation# – Some special bilinear transformations.

### UNIT III

**15 hours**

Definite integral – Cauchy's Theorem – Cauchy's integral formula- #Higher derivatives#.

### UNIT IV

**15 hours**

Taylor's series – Laurent's series – Zeroes of Analytic functions- Singularities.

### UNIT V

**15 hours**

Residues – Cauchy's Residue Theorem- Evaluation of definite integrals.

**## Self-study portion.**

### Text Book:

S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Complex Analysis, NewScitech Publications (India) Pvt. Ltd. 2015.

**UNIT I** Chapter II Sections 2.1 – 2.8

**UNIT II** Chapter II Sections 2.9 &  
Chapter III Sections 3.1 – 3.5

**UNIT III** Chapter VI Sections 6.1 – 6.4

**UNIT IV** Chapter VII Sections 7.1 – 7.4

**UNIT V** Chapter VIII Sections 8.1 – 8.3

### Books for Reference:

1. J.N. Sharma, Functions of a Complex variable, Krishna Prakasan Media (P) Ltd, 13<sup>th</sup> Edition (1996-97).
2. T.K. Manicavachagom Pillay, Complex Analysis, S. Viswanathan Publishers Pvt. Ltd. (1994).

Relationship Matrix for course outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours	Credits			
VI	20UMA6CC14		Complex Analysis			5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√		√	√			√		√	√
CO2	√	√	√			√	√	√		√
CO3		√		√	√	√			√	
CO4	√	√	√	√	√		√	√	√	√
CO5			√	√		√	√	√		√
Number of Matches= 34,Relationship: Moderate										

**Prepared by**

Dr. R. Jahir Hussain

**Checked by**

Ms. S. SharmilaBanu

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6CC15	Core -XV	NUMBER THEORY	5	5	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Gain knowledge and understanding the topics including, but not limited to divisibility, prime numbers, congruences and Diophantine equations.
2. Learn methods and techniques used in Euclidean Algorithm.
3. Understand the meaning and role of different conjectures in number theory.
4. Apply the theory of congruences for solving problems in number theory.
5. Solve problems with the help of number theoretic functions.

### UNIT I

**15 hours**

Divisibility Theory in the integers: The Division Algorithm- #The Greatest Common Divisor#-The Euclidean Algorithm-The Diophantine Equation  $ax+by=c$ .

### UNIT II

**15 hours**

Primes and Their Distribution: The Fundamental theorem of Arithmetic- The Sieve of Eratosthenes- #The Goldbach Conjecture#

### UNIT III

**15 hours**

The Theory of Congruences -Basic Properties of Congruence -Linear Congruences and The Chinese Remainder Theorem-Fermat's Little Theorem and Pseudoprimes - Wilson's Theorem.

### UNIT IV

**15 hours**

Number Theoretic Functions: The Sum and Number of Divisors-The Mobius Inversion Formula- The Greatest Integer Function.

### UNIT V

**15 hours**

Euler's generalization of Fermat's Theorem: Euler's Phi-function- Euler's Theorem-Some properties of the Phi-function.

### # # Self-study portion.

#### Text Book:

David M. Burton, Elementary Number Theory, Seventh Edition, Tata McGraw Hill (2012).

**UNIT I:** Chapter 2 Sections 2.2-2.5

**UNIT II:** Chapter 3 Sections 3.1-3.3

**UNIT III:** Chapter 4 Sections 4.2, 4.4

Chapter 5 Sections 5.2, 5.3

**UNIT IV:** Chapter 6 Sections 6.1-6.3

**UNIT V:** Chapter 7 Sections 7.2-7.4

#### Books for Reference:

1. George E. Andrews, Number Theory, Dover Publications Inc.; New edition (1995).
2. G. H. Hardy, An Introduction to the Theory of Numbers, Oxford University Press; 6th edition (2008).
3. Joseph Silverman, A Friendly Introduction to Number Theory, Pearson Education; Fourth edition (2019).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Course				Hours	Credits			
VI	20UMA6CC15	NUMBER THEORY				5	5			
Course Outcomes COs	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓		✓
CO2	✓		✓	✓	✓	✓	✓	✓		✓
CO3	✓		✓	✓	✓		✓		✓	✓
CO4	✓	✓	✓		✓	✓	✓	✓	✓	
CO5		✓	✓	✓	✓		✓		✓	✓
Number of matches (✓) = 38,Relationship: High										

**Prepared by:**

Mr. N. Mohamed Thoiyab

**Checked by:**

Ms. A. NAFIUNISHA

**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6CC16	Core-XVI	OPERATIONS RESEARCH	5	5	100	25	75

#### Course Outcomes:

At the end of the Course, Students will be able to:

1. Demonstrate and study of operations research and graphical solution method illustrate the examples
2. Classification and study of artificial Variables and Simplex Method
3. Analyse the Dual Simplex Method with illustrate the examples
4. Illustrate the transportation problem and Assignment problems with examples.
5. Construct the network and plan execution with examples.

#### UNIT I

**15 hours**

Introduction – Origin and development of OR – Nature and features of OR – #Applications of OR# – General Linear Programming Problem – Mathematical Formulation of LPP – Graphical Solution Method, Alternative Optimal Solution, Unbounded Solution, Infeasible Solution – Canonical and Standard forms of LPP – Basic Solution – Basic Feasible and Infeasible Solution – Degenerate Solution.

#### UNIT II

**15 hours**

Simplex Algorithm – Use of Artificial Variables – Two Phase Method and Big-M Method – Degeneracy in Linear Programming.

#### UNIT III

**15 hours**

Introduction – General Primal Dual Pair – Formulating a Dual Problem – #Primal-Dual Pair in matrix form# - Duality and Simplex Method, Dual Simplex Method.

#### UNIT IV

**15 hours**

Introduction – LP formulation of the Transportation Problem – Finding an Initial Basic Feasible Solution using North West Corner Rule, #Least Cost Entry Method# and VAM – MODI Method – Assignment Problem – Hungarian method

#### UNIT V

**15 hours**

Introduction – #Network: Basic Components, Logical Sequencing# - Rules of Network Constructions – Critical Path Analysis – Probability consideration in PERT - Distinction between CPM and PERT.

**Note:** Theoretical proofs are not expected

**# ..... # Self-study portion**

#### Text Book:

KantiSwarup, P.K. Gupta and Man Mohan, Operations Research, Sultan Chand and Sons Publishers, New Delhi, 19<sup>th</sup> edition (2017)

**UNIT I :** Chapter 1 Sections 1.1, 1.2, 1.3, 1.10, 3.4, 2.3, 3.1, 3.2, 3.3, 3.5, 4.1

**UNIT II :** Chapter 4 Sections 4.3, 4.4, 4.5

**UNIT III :** Chapter 5 Sections 5.1, 5.2, 5.3, 5.4, 5.7, 5.9

**UNIT IV :** Chapter 10 Sections 10.1, 10.2, 10.9, 10.13, Chapter 11 Sections 11.1, 11.2, 11.3

**UNIT V :** Chapter 25 Sections 25.1, 25.2, 25.3, 25.4, 25.6, 25.7, 25.8

**Books for References:**

1. Sharma, S.D., Operations Research, KedarNath Ram Nath& Co, 15<sup>th</sup> Edition, (2010).
2. Richard Bronson, Theory and Problems of Operations Research, Tata McGraw Hill Publishing Company Ltd., New Delhi, (1982).
3. P.K.Gupta&ManMohan, Problems in Operations Research, Sultan Chand Publications, New Delhi, 6<sup>th</sup> Edition (1994).
4. B.S.Goel and S.K.Mittal , Operations Research, PragathiPrakashan Publishers, Meerut, 16<sup>th</sup> Edition (1999).

**Web Reference:**

1. <https://nptel.ac.in/courses/111/107/111107128/>
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=25>
3. [https://onlinecourses.swayam2.ac.in/cec21\\_ma13/unit?unit=6&lesson=7](https://onlinecourses.swayam2.ac.in/cec21_ma13/unit?unit=6&lesson=7)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code					Title of the Paper			Hours		Credits
VI	20UMA6CC16					OPERATIONS RESEARCH			5		5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓	✓	✓		✓		✓	
CO2	✓	✓		✓	✓	✓		✓		✓	
CO3	✓		✓	✓	✓		✓	✓	✓	✓	
CO4	✓	✓	✓			✓	✓	✓	✓		
CO5		✓	✓	✓	✓		✓		✓	✓	
Number of Matches= 36, Relationship : HIGH											

**Prepared by:**

Dr. V. Krishnan

**Checked by:**

Ms. M.S. AfyaFarhana

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6DE2A	DSE – II	ASTRONOMY	5	4	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recall and Recognize the basic concepts of trigonometry and discuss spherical trigonometry.
2. Examine Astronomical refraction and discuss Tangent and Cassini's formulas for refraction.
3. Determine the Newton's deductions.
4. Interpret the different types of Seasons.
5. Evaluate the properties of Eclipses.

### UNIT I

**15 hours**

Formula for spherical Trigonometry – Celestial Sphere – Diurnal motion.

### UNIT II

**15 hours**

Dip of Horizon – Twilight – Refraction – Astronomical refraction – Tangent and Cassini's formula for refraction.

### UNIT III

**15 hours**

Kepler's laws of planetary motion – Newton's deductions from them – Three anomalies of the earth and relations between them.

### UNIT IV

**15 hours**

Time – Equation of time – Seasons.

### UNIT V

**15 hours**

Moon – Eclipses.

**# # Self-study portion.**

### Text Books:

"Astronomy" by Prof . Kumaravelu and **Prof.SushseelaKumaravelu** .(Revised and enlarged edition 2013).

### UNIT-I

Chapter I –Sections: 21 – 23, 25 and  
Chapter II –Sections: 39 - 63, 66-68 , 69 – 79 , 80 – 83.

### UNIT-II

Chapter III –Sections : 106 -116 Chapter IV –Sections : 117 – 133

### UNIT-III

Chapter VI– Sections :146, 153 and 156 – 163.

### UNIT-IV

Chapter VII –Sections: 166 – 170 , 172 , 173

### UNIT-V

Chapter XII– Sections 229 -24, Chapter XIII –Sections 256 – 263, 267 – 270

### Books for Reference:

1. Introduction to Astronomy and Cosmology by Ian Morison, A John Wiley and Sons Limited Publications(2008)
2. W.M. Smart, Textbook on Spherical Astronomy, Cambridge University Press (1999).
3. Barlow, Elementary Mathematical Astronomy, Barlow Prentice-Hall (1983).

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester	Code		Title of the Paper				Hours		Credits	
VI	20UMA6DE2A		ASTRONOMY				5		4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		√	√	√	√	√	√	√	√	√
CO2	√	√			√		√		√	√
CO3			√	√		√		√		
CO4	√	√		√	√	√	√		√	
CO5	√		√		√	√		√	√	√
Number of Matches= 34, Relationship : MODERATE										

**Prepared by :**

Dr.M.MohammedJabarulla

**Checked by :**

Ms. B. ShafinaBanu

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
VI	20UMA6DE2B	DSE II	DATA STRUCTURES AND ALGORITHMS	5	4	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recognize the Basic Concepts of Data Structures and Algorithms.
2. Discuss the concepts of Arrays and Stacks.
3. Apply the Domain knowledge of Arrays to study Queues and Linked list.
4. Discuss the Graph Theory ideas on Trees and Matrices.
5. Describe Sorting and Searching.

### UNIT I 15 hours

Introductions and Preliminaries: Basic Terminology, Elementary data organization, Data Structures- Data Structure Operations, Algorithms: Complexity, Time-Space Trade off- Mathematical Notations and Functions – Control Structures- Complexity of Algorithms.

### UNIT II 15 hours

Arrays and Stacks: Arrays- Introduction – Linear Array, Representation of Linear Array in memory, Traversing Linear Arrays, Inserting and Deleting, Multidimensional Arrays- Stacks – Array representation of Stack, Arithmetic Expressions: Polish Notation - #Recursion#

### UNIT III 15 hours

Queues and Linked Lists: Queues – De-queues – Array Representation Queues – Insertion and Deletion – Linked list, Representation of Linked list in memory, Traversing a Linked list, Insertion into a Linked list, Deletion from a Linked list. #two way linked list#

### UNIT IV 15 hours

Trees and Graphs: Binary Trees, Representing Binary Trees in Memory, Traversing Binary Tree-threads, Binary search tree, Searching and Inserting in Binary search tree, Deleting in Binary Search tree – Graph Theory- Terminology, Sequential Representation of Graph: Adjacency Matrix, Path Matrix

### UNIT V 15 hours

Sorting and Searching: Sorting- Bubble Sort, Insertion Sort, Selection Sort, #Merge Sort#, Quick Sort, Heap Sort- Searching: Linear Search, Binary Search.

**## Self-study portion.**

### Text Book:

Seymour lipschutz and G.A.VijayalakshmiPai (Schaum's Series), Data Structures, Tata Mcgraw Hill Publishing Company Ltd., New Delhi, Indian Adopted Edition, 2006.

**UNIT I ChapterI** Sections 1.1 – 1.5, **Chapter II** Sections 2.2, 2.4, 2.5

**UNIT IIChapterIV** Sections 4.1- 4.5, 4.9, **Chapter VI** Sections 6.1- 6.3, 6.5, 6.7

**UNIT III ChapterVI** Sections 6.1.0- 6.1.2, **Chapter V** Sections 5.1 – 5.4, 5.7 – 5.8, 5.1.0

**UNIT IV ChapterVI** Sections 7.1- 7.9, **Chapter VII** Sections 8.1 – 8.3

**UNIT V ChapterIX** Sections 9.1 – 9.6, 4.6 – 4.8, 6.6, 7.17**Books for Reference:**

1. Prof. R.S. Salaria, Data Structures and Algorithms using C (fifth Edition - 2018), Khanna Book Publishing Co.(P) Ltd., New Delhi.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
VI	20UMA6DE2B		Data Structures and Algorithms			5		4		
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√		√	√			√		√	√
CO2	√	√	√			√	√	√		√
CO3		√		√	√	√			√	
CO4	√	√	√	√	√		√	√	√	√
CO5			√	√		√	√	√		√
Number of Matches= 34, Relationship: Moderate										

**Prepared by**

M.S. AfyaFarhana

**Checked by**

Dr.M. Mohamed Althaf

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6DE3A	DSE III	MATHEMATICA AND MATLAB	4	4	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Using Mathematica and MATLAB as a scientific calculator
2. Implement and illustrate 2 -D graphs and 3-D graphs
3. Understanding of linear algebra, Differential equations and Operations Research
4. Evaluate, analyze and plot results using both Mathematica and MATLAB.
5. Make use of theoretical concepts to solve problems and visualize the output.

### List of Practical- Mathematica and MATLAB

1. Solving higher degree equations.
2. Solving system of equations by matrix method and find the Eigen values and Eigen vectors of a matrix of order 4 by 4 or #higher order#.
3. Solving system of non-linear equations.
4. Finding the differentiation of different functions of second and third derivatives.
5. Finding the Integration of different functions with limits.
6. Evaluation of double integrals and #triple integrals#.
7. Solving ordinary differential equations with initial condition.
8. Solving system of ordinary differential equations.
9. Creating and plotting 2-D and 3-D graphs.
10. Solving Linear programming problems.

### # -- # Self-study portion.

#### Text Books:

**T.B-1 :** Eugene Don, *Mathematica*, Scham's Outline Series, Mc Graw Hill Publisher, New York. (2009)

**T.B-2 :**PragathiGautam and SwapnilVerma, *Practical Mathematica*, Ane Books Publisher (2019).

**T.B-3:** RudraPratap, *Getting Started with MATLAB a Quick Introduction for Scientists and Engineers*, Oxford University Press (2010)

**T.B-4:**Rizwan Butt, *Introduction to Numerical Analysis Using MATLAB*, Infinity Science Press LLC, Published by Firewall Media, New Delhi (2008).

#### Books for Reference:

1. Ananta Kumar Bora, *Mathematica:A Research Book of Mathematics*, Scholarink Publishers (2017)

2. Sal Mangano, *Mathematica Cookbook*, O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol,USA (2010)

1. Brian R. Hunt, Ronald L. Lipsman and Jonathan M. Rosenberg, *A Guide to MATLAB for Beginners and Experienced Users*, Cambridge University Press, 2001.

2. David Houcque, *Introduction to MatLab forEngineering Students*, North-western University (Aug. 2005)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes :

Semester	Code		Title of the Paper			Hours	Credits			
VI	20UMA6DE3A		Mathematica and MATLAB			4	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√	√			√		√		√	√
CO2	√		√	√		√	√	√		
CO3		√		√	√			√		√
CO4			√		√	√	√	√	√	
CO5	√	√		√	√		√		√	√
Number of Matches= 30 , Relationship : HIGH										

**Prepared by :**  
Dr.A.Prasanna

**Checked by :**  
Mr. T. ShiekPareeth

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6DE3B	DSE – III	Z AND FOURIER TRANSFORM	4	4	100	25	75

### Course Outcomes

At the end of the Course, Students will be able to:

1. Recognize the knowledge for Z-Transforms with examples.
2. Discuss the Z-transform with their properties.
3. Evaluate the Integral and Fourier transforms with Fourier Cosine and Sine Integrals.
4. Demonstrate the Convolution Theorem and Parseval's Identity for Fourier Transforms.
5. Analyze the Fourier transforms of the derivatives of a function with examples.

### UNIT I

**12 hours**

Introduction – Definition of Z-transform – Some standard Z-transform – Linearity Property – Damping Rule – Some standard results – Shifting  $U_n$  to the right and to the left – Multiplication by  $n$  – Two basic Theorems.

### UNIT II

**12 hours**

Some useful Z-transforms – Some useful Inverse Z-transforms – Convolution Theorems – Convergence of Z-transforms – Two-sided Z-transforms of  $U_n$  – Evaluation of Inverse Z-transforms – Application to Difference Equations#.

### UNIT III

**12 hours**

Introduction – Definition of Integral Transform–Fourier Integral Theorem– Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier Transforms – Fourier sine and cosine Transforms – Finite Fourier sine and cosine Transforms.

### UNIT IV

**12 hours**

Properties of Fourier Transforms with examples – Convolution theorem for Fourier Transforms.

### UNIT V

**12 hours**

Parseval's Identity for Fourier Transforms – Relation between Fourier and Laplace Transforms – Fourier Transforms of the derivatives of a function – Application of Transforms to Boundary value problems with examples#.

**# # Self-study portion.**

### Text Books:

Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>nd</sup> Edition, 2012.

Unit I	Chapter 23	Sections 23.1-23.9
Unit II	Chapter 23	Sections 23.10-23.16
Unit III	Chapter 22	Sections 22.1-22.4
Unit IV	Chapter 22	Sections 22.5, 22.6
Unit V	Chapter 22	Sections 22.7-22.9, 11

### PDF Link:

<https://www.mediafire.com/file/cha2r48pno471wp/BSG.pdf/file>

### Books for Reference:

**T.B-1** Sarveswara Rao Koneru, Engineering Mathematics, Universities Press(India) Private Limited, 2004(Reprint)

**T.B-2** M.K. Venkataraman, Engineering Mathematics-III B, National Publishing Company Thirteenth edition 1998.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
VI	20UMA6DE3B		Z AND FOURIER TRANSFORM			4		4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2			✓	✓			✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO4		✓	✓	✓			✓	✓	✓	✓
CO5			✓	✓	✓		✓	✓	✓	✓
Number of Matches= 38, Relationship : HIGH										

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Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UMA6EC2	Extra Credit Course – II	MATHEMATICS FOR COMPETITIVE EXAMINATIONS	-	4*	100	-	100

### Course Outcomes

At the end of the Course, Students will be able to:

1. Utilize the concept of groups, rings, fields and vector spaces to solve the problems.
2. Be exposed to concepts in real analysis to solve the problems in various entrance examinations.
3. Apply the concepts of complex differentiability and integrability
4. Use integral calculus, vector calculus and related theorems to solve the problems in various entrance examinations.
5. Understand and solve the problems based on exact differential equations and LPP.

### UNIT I

**Algebra:** Groups, subgroups, Abelian groups, non-abelian groups, cyclic groups, permutation groups; Normal subgroups, Lagrange's Theorem for finite groups, group homomorphism and quotient groups, Rings, Subrings, Ideal, prime ideal. Maximal ideals; Fields, quotient field. Vector spaces, Linear dependence and Independence of vectors, basis, dimension, linear transformations, matrix representation with respect to an ordered basis, Range space and null space, rank-nullity theorem; Rank and inverse of a matrix, determinant, solutions of systems of linear equations, consistency conditions. Eigenvalues and eigenvectors. Cayley-Hamilton theorem. Symmetric, Skew symmetric, Hermitian, Skew-Hermitian, Orthogonal and Unitary matrices.

### UNIT II

**Real Analysis:** Sequences and series of real numbers. Convergent and divergent sequences, bounded and monotone sequences, Convergence criteria for sequences of real numbers, Cauchy sequences, absolute and conditional convergence; Tests of convergence for series of positive terms-comparison test, ratio test, root test, Leibnitz test for convergence of alternating series. Functions of one variable: limit, continuity, differentiation, Rolle's Theorem, Cauchy's and Taylor's theorem. Interior points, limit points, open sets, closed sets, bounded sets, connected sets, compact sets; completeness of  $\mathbb{R}$ , Power series (of real variable) including Taylor's and Maclaurin's, domain of convergence, term-wise differentiation and integration of power series. Functions of two real variable: limit, continuity, partial derivatives, differentiability, maxima and minima. Method of Lagrange multipliers, Homogeneous functions including Euler's theorem.

### UNIT III

**Complex Analysis:** Functions of a complex Variable, Differentiability and analyticity, Cauchy Riemann Equations, Power series as an analytic function, properties of line integrals, Goursat Theorem, Cauchy theorem, consequence of simply connectivity, index of a closed curves. Cauchy's integral formula, Morera's theorem, Liouville's theorem, Fundamental theorem of Algebra, Harmonic functions.

### UNIT IV

**Integral Calculus:** Integration as the inverse process of differentiation, definite integrals and their properties, Fundamental theorem of integral calculus. Double and triple integrals, change of order of integration. Calculating surface areas and volumes using double integrals and applications. Calculating volumes using triple integrals and applications.

**Vector Calculus:** Scalar and vector fields, gradient, divergence, curl and Laplacian. Scalar line integrals and vector line integrals, scalar surface integrals and vector surface integrals, Green's, Stokes and Gauss theorems and their applications.

### UNIT V

**Differential Equations:** Ordinary differential equations of the first order of the form  $y'=f(x,y)$ . Bernoulli's equation, exact differential equations, integrating factor, Orthogonal trajectories, Homogeneous differential equations-separable solutions, Linear differential equations of second and higher order with constant coefficients, method of variation of parameters. Cauchy-Euler equation.

**Linear Programming:** Convex sets, extreme points, convex hull, hyper plane & polyhedral Sets, convex function and concave functions, Concept of basis, basic feasible solutions, Formulation of Linear Programming Problem (LPP), Graphical Method of LPP, Simplex Method.

**Books for Reference:**

1. S. Arumugam and A. Thangapandi Isaac, Modern Algebra, SciTech Publications (India) Pvt. Ltd, Chennai, Reprint (2013).
2. M.K. Singal and Asha Rani Singal, A first course in Real Analysis, R. Chand & Co. (1999)
3. Robert G. Bartle and Donald R. Sherbert, Introduction to Real Analysis, Wiley India Pvt.,Ltd. Fourth Edition (2011).
4. S. Arumugam, A. Thangapandi Isaac and A. Somasundaram, Complex Analysis, New Scitech Publications (India) Pvt. Ltd. 10th Reprint (2009).
5. S. Narayanan and T. K. Manicavachagom Pillay, Vector Algebra and Analysis, S. Viswanathan Publishers Pvt. Ltd., Revised Edition (1995)
6. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010)
7. KantiSwarup, P.K. Gupta and Man Mohan, Operations Research, Fourteenth Edition, Sulthan Chand and Sons(Reprint 2009).
8. S.Narayanan and T.K.Manicavachagom Pillay, Calculus Volume II, S.Viswanathan (Printers & publishers) Pvt Limited, Chennai -2011.
9. P.R. Vittal, Vector analysis, Analytical Geometry & sequences and series, Margham Publications, Chennai (2004).
10. Vijay K. Khanna and S.K. Bhambri, A course in abstract algebra, fourth edition, Vikas publishing house PVT LID, 2013.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours	Credits		
VI	20UMA6EC2		MATHEMATICS FOR COMPETITIVE EXAMINATIONS				-	4*		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓		✓	✓		✓	✓	✓
CO2	✓	✓		✓	✓	✓		✓		✓
CO3		✓	✓	✓	✓		✓		✓	✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓		✓	✓	✓	✓	✓		✓	✓
Number of Matches= 37, Relationship : HIGH										

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