



## SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)

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## DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS FOR

**B.Sc. MATHEMATICS PROGRAMME**

(SEMESTER PATTERN)

(For Students Admitted in the College from the Academic Year 2021-2022 Onwards)



### Programme Outcomes (POs)

<b>PO1</b>	<b>Communicate Effectively</b> - Well versed in communicating both in English (as medium of instruction) and Tamil (mother's tongue), distinguish between professional and non-professional dialogues. Develop LSRW (Listening, Speaking, Reading, Writing) skills with advanced technologies.
<b>PO2</b>	<b>Environment Concern</b> - Follow RRRR (Reduce, Reuse, Recycle, Refuse) and develop affinity towards environment and practice save Nature and Water.
<b>PO3</b>	<b>Ethical and Healthy Practice</b> - Adhere to values in day to day life, practice yoga and other physical exercises, hence, develop self - respect and self- esteem, have strong integrity.
<b>PO4</b>	<b>Social Consciousness</b> - Understand the rural situations through ERP (Empowering Rural People), and develop social consciousness, solve the issues through interaction, become mediator/ moderator between government and people, and become true citizen of our Nation.
<b>PO5</b>	<b>Subject Specialist</b> - Acquaint their own subject and integrate with other disciplines (CBCS) with advanced technologies and become a Regional, National and Global competitor.



### Programme Specific Outcomes (PSOs)

<b>PSO1</b>	Students will develop and apply concepts of expressions, equations and inequalities to investigate and describe.
<b>PSO2</b>	Real Numbers and Algebraic Expressions. Classify and Define Properties of Real Numbers. Solve Multi-Step Linear Equations. Problem Solving.
<b>PSO3</b>	Simplify and perform arithmetic operations on rational algebraic expressions, including those with radicals and perform the basic arithmetic operations of addition, subtraction, multiplication and division on polynomials.
<b>PSO4</b>	Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
<b>PSO5</b>	The course includes axioms of real number systems, uniform convergence of sequences and series of functions, equi-continuity.
<b>PSO6</b>	Formulate and solve problems as networks and graphs. Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems. Use CPM and PERT techniques, to plan, Schedule and control project activities.
<b>PSO7</b>	Complex numbers, analytic functions, Cauchy integral theorem, Cauchy integral formula, power series and conformal mapping.
<b>PSO8</b>	Fluid, solid or continuum mechanics. You have good knowledge of a broad range of methods and techniques based on mechanics and can use them for analysis and problem solving.
<b>PSO9</b>	Correlation and Regression analysis, Multiple Regression and Statistical Forecasting.
<b>PSO10</b>	Analyze vector functions to find derivatives, tangent lines, integrals, arc length, and curvature, Differentiate vector fields, Determine gradient vector fields and find potential functions, Evaluate line integrals directly and by the fundamental theorem.
<b>PSO11</b>	To appreciate the basic principles of Boolean algebra, Logic, Set Theory, Permutations.



## SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

**Bachelor of Science (B.Sc.) in Mathematics**

**Programme Pattern and Syllabus (CBCS)**

(For Students Admitted in the College from the Academic Year 2021-2022 Onwards)

Sl. No.	Part	Nature of Course	Course Code	Name of the Course	Hours/Week	Credits	Marks		
							CIA	ESE	Total
<b>SEMESTER I</b>									
1	I	Language	21UTA1F01	Foundation Tamil – I	5	3	25	75	100
2	II	Language	21UEN1F01	Communicative English – I	5	3	25	75	100
3	III	Core – I	21UMA1C01	Algebra and Trigonometry	5	4	25	75	100
4		Core –II	21UMA1C02	Logic, sets and Boolean Algebra	5	5	25	75	100
5		Allied – I	21UPHA01	Allied Physics – I	4	4	25	75	100
6		Allied Practical – I Extended to Semester II	21UPH1A01	Allied Physics Practical – I	2	Credit and marks are carried to Allied Practical – I of Semester II			
7	IV	Value Education	21UVE101	Yoga	1	2	25	75	100
8		Add-on Course	21UPS1AO01	Professional English-I	3	4	25	75	100
<b>Total</b>					<b>30</b>	<b>24</b>	<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER II</b>									
9	I	Language	21UTA2F02	Foundation Tamil – II	5	3	25	75	100
10	II	Language	21UEN2F02	Communicative English – II	5	3	25	75	100
11	III	Core – III	21UMA2C03	Integral and Vector Calculus	5	5	25	75	100
12		Core – IV	21UMA2C04	Differential Equations	5	5	25	75	100
13		Allied – II	21UPH2A02	Allied Physics – II	4	3	25	75	100
14		Allied Practical – I Extended from Semester I	21UPH2AP01	Allied Physics Practical – I	2	3	40	60	100
15		Common Paper	21UES201	Environmental Studies	1	2	25	75	100
16		Add-on Course	21UPS2AO02	Professional English-II	3	4	25	75	100
<b>Total</b>					<b>30</b>	<b>29</b>	<b>215</b>	<b>585</b>	<b>800</b>
<b>SEMESTER III</b>									



17	I	Language	21UTA3F03	Foundation Tamil – III	5	3	25	75	100
18	II	Language	21UEN3F03	Foundation English – III	5	3	25	75	100
19		Core – V	21UMA3C05	Real analysis-I	6	5	25	75	100
20		Core – VI	21UMA3C06	Mechanics	5	4	25	75	100
21		Allied – III	21UCH3A01	Allied Chemistry – I	5	4	25	75	100
22		Allied Practical– II Extended to Semester IV	21UCH3AP01	Allied Chemistry Practical – I	2	Credit and marks are carried to Allied Practical – II of Semester IV			
23	IV	Non-Major Elective – I	21UCS1N01	NMEC-Basics of Computers	2	2	25	75	100
<b>Total</b>					<b>30</b>	<b>21</b>	<b>150</b>	<b>450</b>	<b>600</b>
<b>SEMESTER IV</b>									
24	I	Language	21UTA4F04	Foundation Tamil – IV	5	3	25	75	100
25	II	Language	21UEN4F04	Foundation English – IV	5	3	25	75	100
26		Core – VII	21UMA4C07	Real Analysis-II	6	5	25	75	100
27		Core – VIII	21UMA4C08	Graph theory	5	5	25	75	100
28		Allied – IV	21UCH4A02	Allied Chemistry – II	5	3	25	75	100
29		Allied Practical– II Extended from Semester IV	21UCH4AP01	Allied Chemistry Practical – I	2	3	40	60	100
30	IV	Non-Major Elective – II	21UCS2N02	NMEC-Basics of Internet	2	2	25	75	100
<b>Total</b>					<b>30</b>	<b>25</b>	<b>190</b>	<b>510</b>	<b>700</b>
<b>SEMESTER V</b>									
31		Core Course – IX	21UMA5C09	Abstract Algebra	5	5	25	75	100
32		Core Course – X	21UMA5C10	Complex Analysis–1	6	5	25	75	100
33		Core Course – XI	21UMA5C11	Mathematical Statistics – I	5	5	25	75	100
34		Major Elective – I	21UMA5CE01	Operations Research	5	4	25	75	100
35		Major Elective – II	21UMA5CE03	Numerical Methods	5	4	25	75	100
36	IV	SBEC – I	21UMA5S01	C-Programming	2	2	25	75	100
37		SBEC – II	21UMA5SP01	C-Programming Practical	2	2	40	60	100
<b>Total</b>					<b>30</b>	<b>27</b>	<b>190</b>	<b>510</b>	<b>700</b>
<b>SEMESTER VI</b>									



38	III	Core Course – XII	21UMA6C12	Linear Algebra	6	5	25	75	100
39		Core Course – XIII	21UMA6C13	Complex Analysis – II	6	4	25	75	100
40		Core Course – XIV	21UMA6C14	Mathematical Statistics – II	6	4	25	75	100
41		Major Elective – III	21UMA6CE07	Analytical Geometry of 2-D and 3-D	6	4	25	75	100
42	IV	SBEC – III	21UMA6S03	Quantitative Aptitude	4	3	25	75	100
43		SBEC – IV	21UMA6SP02	R-Programming (Statistics) Practical	2	2	40	60	100
		Extension Activities				1			
<b>Total</b>					<b>30</b>	<b>23</b>	<b>165</b>	<b>435</b>	<b>600</b>
<b>Grand Total</b>					<b>180</b>	<b>148</b>	<b>1085</b>	<b>3015</b>	<b>4100</b>

### Note

- CBCS – Choice Based Credit system  
 CIA – Continuous Internal Assessment  
 ESE – End of Semester Examinations  
 SWAYAM – Study Webs of Active-Learning for Young Aspiring Minds  
 NPTEL – National Programme on Technology Enhanced Learning

### List of Extension Activities

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)



## Allied Mathematics for B.Sc Chem / Phy / BCA / CS

S. NO	Department	Sem	Course Code	Course Title	Hours/Week	Credits	Marks		
							CIA	ESE	Total
1.	B.Sc Chemistry/ Physics / BCA/CS	I	21UMA1A01	Allied Mathematics-I	6	5	25	75	100
2.	B.Sc Chemistry/ Physics / BCA/CS	II	21UMA2A02	Allied Mathematics-II	6	5	25	75	100
3.	B.Sc Chemistry	II	21UMA2AP01	Latex Practical	2	3	40	60	100

## Allied for BBA and BBA (CA)

S. NO	Department	Sem	Course Code	Course Title	Hours/Week	Credits	Marks		
							CIA	ESE	Total
1.	BBA	I	21UMB1A01	Business Mathematics and Statistics –I	5	4	25	75	100
2.	BBA(CA)	I	21UMX1A01	Business Mathematics and Statistics	5	4	25	75	100
3.	BBA	II	21UMB2A02	Business Mathematics and Statistics-II	5	4	25	75	100
4.	BBA(CA)	III	21UMX3A02	Operations Research	5	3	25	75	100
5.	BBA	V	21UMB5A03	Operations Research	5	4	25	75	100



## Allied for B.Com and B.Com (CA)

S. NO	Department	Sem	Course Code	Course Title	Hours/Week	Credits	Marks		
							CIA	ESE	Total
1.	B.Com & B.Com(CA)	III	21UMA3A03	Business Statistical Methods	6	4	25	75	100
2.	B.Com & B.Com(CA)	IV	21UMA4A04	Business Mathematics and Statistical Techniques	6	4	25	75	100

## NMEC

1.	For All Department	IV	21UMA4N04	Quantitative Aptitude	2	2	25	75	100
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# PROGRAMME SYLLABUS



Program: B.Sc. Mathematics				
Core – I		Course Code:21UMA1C01		Course Title: Algebra and Trigonometry
Semester I	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### Course Objectives

1. In this course students are exposed to topics like Matrices, Theory of equation, Reciprocal equations, Expansions of terms, and Hyperbolic, Inverse hyperbolic.
2. The stress is on the development of problems solving skills.

#### **Unit– I: Matrices**

Characteristic equation – Characteristic roots and Characteristic vectors – properties – problems - Cayley – Hamilton theorem (statement only) and its problems –Diagonalization of Matrices – problems.(Chapter 6, Page: 6.50-6.82).

#### **Unit –II: Theory of equation**

Relation between roots and coefficients of equations –Imaginary and irrational roots-Symmetric functions of roots in terms of coefficients of third degree equation – problems. (Chapter 7, Page: 7.1-7.30).

#### **Unit –III: Reciprocal equations**

Reciprocal equations- Transformation of equations – Roots with sign changed – Roots multiplied by a given number – problems. Diminishing the roots of an equations– Removal of terms– Descartes’ rule of signs–Horner’s Method–Newton Method of evaluating a real root correct to given decimal places-problems (Chapter 7, Page:7.30-7.67).

#### **Unit –IV: Expansions of terms**

Expansions of  $\sin n\theta$ ,  $\cos n\theta$  and  $\tan n\theta$  – Expansions of  $\sin^n \theta$ ,  $\cos^n \theta$  in terms of multiples angles of  $\theta$  -Expansions of  $\sin \theta$ ,  $\cos \theta$  in ascending power of  $\theta$ -problems.(Chapter 11, page: 11.1-11.27).

#### **Unit –V: Hyperbolic and Inverse hyperbolic**



Hyperbolic Function and its properties –Relation between circular and hyperbolic functions - Inverse hyperbolic function problems (Chapter 11, Page: 11.31-11.56).

### Text Book

Dr. P.R.Vittal and V.Malini, Algebra Analytical Geometry and Trigonometry, Margham Publications, Chennai – 17999, Third Edition 2000.

### Reference Books

1. T.K.Manicavachagam Pillai, T.Natarajan, K.S.Ganapathy, Algebra Volume I – S.Viswanathan Printers and Publishers Pvt. Ltd., 2004.
2. A. Singaravelu and R.Ramaa, Algebra and Trigonometry –I, Meenakshi Agency, Chennai, June 2003
3. P.Duraipandian, Dr. S.Udayabaskaran, Allied Maths Volume –1, Muhil Publishers Chennai – 28, Reprint 1999.
4. S.Narayanan, T.K.Manicavachagam Pillay, Trigonometry, Publisher: Viswanathan , S., Printers & Publishers Pvt. Ltd., 2004 Edition.

### E-Learning Source

<http://www.sosmath.com>

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Study the concept of Matrices and Cayley- Hamilton theorem.	K1
CO2	Finding the solution of Theory of equations.	K2
CO3	Study the concept of Reciprocal Equations	K2& K3
CO4	Evaluate Expansions of $\cos n\theta$ and $\sin n\theta$ .	K4&K5
CO5	Obtain the solution of Hyperbolic functions and Inverse hyperbolic functions.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

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



Program: B.Sc. Mathematics				
Core – II		Course Code:21UMA1C02		Course Title: Logic, sets and Boolean Algebra
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	5	75	5	100

### Course Objectives

To extend student's Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems. Gain knowledge about the concept of Mathematical logic and algebraic structures. Know about Boolean algebra and its application to Sequential Machines. Make them to use in practical applications related to computer science.

#### **UNIT – I: Mathematical logic**

Connectives: Negation – Conjunction – Disjunction – Statement formulas and Truth table – Conditional and Bi-conditional – Well- formed formulas-Tautologies. (Chapter 1: Sections 1.2.1 to 1.2.4, 1.2.6 to 1.2.8, Page No.: 7-14 & 18-26).

#### **UNIT – II: Mathematical logic (Continued)**

Normal forms: Disjunctive Normal forms – Conjunctive Normal forms – Principal Disjunctive Normal forms – Principal conjunctive normal forms. (Chapter 1: Sections 1.3.1 to 1.3.4, Page No.: 50-58).The theory of inference for the statement calculus: Validity using truth tables – Rules of inference – Consistency of premises and indirect method of proof. (Chapter 1: Sections 1.4.1 to 1.4.3, Page No.: 65-73).

#### **UNIT – III: Mathematical logic (Continued)**

The predicate calculus: Predicates – The Statements function, Variables and quantifiers – Predicate formulas – Free and bound variables – The universe of discourse. (Chapter 1: Sections 1.5.1 to 1.5.5, Page No.: 79-89).Inference theory of the predicate calculus: Valid formulas and Equivalences – Some valid formulas over finite Universes – Special valid formulas involving quantifiers – Theory of inference for the predicate calculus. (Chapter 1: Sections 1.6.1 to 1.6.4, Page No.: 90-99).

**UNIT – IV: Set Theory**

Relations and ordering: Relations – Properties of binary relation in a set– Functions– Definition and introduction – Composition of functions – inverse functions– Natural numbers– Peano axioms and Mathematical Induction. (Chapter 2: Sections 2.3.1-2.3.2 and 2.4.1-2.4.3 and 2.5.1, Page No.: 148-155, 192-203 and 220-224).

**UNIT – V: Lattices and Boolean algebra**

Lattices as partially ordered sets: Definition and Examples – Some properties of Lattices– Boolean algebra–Definition and example – Sub algebra, Direct Product and homomorphism – Boolean Functions – Boolean forms and free Boolean algebra – values of Boolean expression and Boolean functions. (Chapter 4: Sections 4.1.1-4.1.2, 4.2.1-4.2.2 and 4.3.2, Page No.: 378-384, 397-403 and 406-416).

**Text Book**

J.P. Trembly, R. Manohar, Discrete Mathematical Structure with Applications to Computer Science, Tata McGraw Hill, 2001.

**Reference Books**

1. Prof. V. Sundaresan, K. S. Ganapathy Subramaniyan, K. Ganesan, Discrete Mathematics, Tata Mc Graw Hill, New Delhi, 2000.
2. L. Lovarz, J. Pelikan, K. Vexztergombi, Discrete Mathematics, Springer International Edition, 2002.
3. N. Chandrasekaran M. Uma parvathi, Discrete Mathematics, PHI Learning P. Ltd. 2010.
4. Dr. M.K. Sen and Dr. B.C. Charraborthy, Introduction to Discrete Mathematics, Arunabha Sen Books & Allied Pvt. Ltd., 8/1 Chintamoni Das Lane, Kolkata – 700009, Reprinted in 2016.

**E–Learning Sources**

1. <https://ocw.mit.edu/courses/electrical-engineering-andcomputer-science/6-042j-mathematics-for-computer-science-fall-2005>
2. [www.crectirupati.com>default>files](http://www.crectirupati.com>default>files)
3. [www.mafy.lut.fi>Lectures>Lecture2](http://www.mafy.lut.fi>Lectures>Lecture2)
4. [Faculty.atu.edu>mfinan>main2](http://Faculty.atu.edu>mfinan>main2)

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Understand Logic and properties.	K1
CO2	Derived Normal forms and The theory of inference for the statement calculus.	K1&K2
CO3	Describe The predicate calculus and Inference theory of the predicate calculus.	K2& K3
CO4	Define and illustrate the Relations and ordering.	K4&K5
CO5	Describe Lattices as partially ordered sets.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core – III		Course Code:21UMA2C03		Course Title: Integral and Vector Calculus
Semester II	Hours/Week	Total Hours	Credits	Total Marks
	5	75	5	100

### Course Objectives

To develop problem solving skills in Calculus and provide base for higher Mathematics and to develop deep understanding of key concepts followed by problems of applied mathematics, which are essential, tools of modern applied mathematics.

#### **UNIT – I: Curvature and Radius of Curvature**

Curvature and radius of curvature – Definitions, Cartesian formula for radius curvature, Parametric formula for radius of curvature - Radius of curvature in polar co-ordinates, Radius of curvature for pedal curves, Radius of Curvature for polar tangential curves – problems.(Chapter 6: Page No.: 6.1-6.19, 6.22-6.32).

#### **UNIT – II: Reduction Formula**

Bernoulli's formula for integration by parts, Reduction formulae – Problems.(Chapter 11: Page No.: 11.1-11.32).

#### **UNIT – III: Beta, Gamma Functions**

Beta and Gamma functions, Properties, Relation between Beta and Gamma functions, Evaluations of definite integrals using Beta and Gamma functions – Problems. (Chapter 13: Page No.: 13.1-13.27)

#### **UNIT – IV: Vector Integration**

Vector integration – Line integral – Application of line integral-Surface and Volume integrals – Problems. (Chapter 2: Page No.: 59-89).

#### **UNIT – V: Vector Integration (Continuation)**

Gauss Divergence theorem -Stoke's theorem – Green's theorem in plane– Problems. (Chapter 2: Page No.: 89-106, 108-126, 129-140).



**Text Books**

1. P.R. Vittal and V. Malini, Calculus, Margham Publications, Chennai, 2012 (for UNIT I, II, III).
2. P.R. Vittal and V. Malini, Vector Analysis, Margham Publications, Chennai, 2006 (for UNIT IV, V).

**Reference Books**

1. S.Narayanan, T.K.Manicavachagam Pillay, Trigonometry, Publisher: Viswanathan , S.,Printers&Publishers Pvt. Ltd, 2004
2. T.K.Manicavasagam Pillai, Natarajan and Ganapathy, Algebra Vol.1 Publisher: Viswanathan , S.,Printers&Publishers Pvt. Ltd, 2004
3. P. Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Chennai, Reprint 2003.

**E-learning Sources**

1. <https://online.math.uh.edu/HoustonACT/videocalculus/>
2. <http://www.math.hmoedu/calculus/tutorials/vector analysis/>



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Find the Curvature and radius of curvature in polar coordinates.	K1
CO2	Solving technique of integrals, Integration by parts and Bernoulli's formula.	K2
CO3	Discuss Beta & Gamma functions.	K2& K3
CO4	Define a vector differentiation, Find and interpret of vector differential operator, Gradient, Direction and magnitude of gradient.	K4
CO5	Evaluate Gauss divergence theorem, Stoke's theorem and Green's theorem.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core – IV		Course Code:21UMA2C04		Course Title: Differential Equations
Semester II	Hours/Week	Total Hours	Credits	Total Marks
	5	75	5	100

### Course Objectives

1. To help the learners to solve standard types of ordinary and partial differential equations.
2. Know about Laplace transforms and its application of differential equations.

#### **UNIT – I: Equations of the First Order and of the First Degree**

Equations of the First Order –Variables Separable – Homogeneous and Non-Homogeneous Equations of the first Degree in  $x$  and  $y$  – Exact Differential Equations– Integrating factor – Problems only. (Chapter- 2, Section 2.1 to 2.8, Page: 2.1 to 2.74).

#### **UNIT – II: Linear Equations of the Second Order with variable coefficients and Total Differential Equations**

Second order differential Equations with variable co-efficient – Method of variation of parameters – simple problems – Total differential equations - Problems. (Chapter-7, Section 7.1 to 7.11, Page : 7.1 to 7.50 )and (Chapter-8, Section 8.1 to 8.5, Page: 8.1 to 8.22).

#### **UNIT – III: Partial Differential Equations**

Formation of equation by eliminating arbitrary constants and arbitrary functions – Types of Solution of P.D.E – Solutions of first order P.D.E in the standard forms – Lagrange's Linear equation  $Pp + Qq = R$  – Solution of the simultaneous Equations. (Chapter-9: Section :9.1 to 9.8, Page : 9.1 to 9.62).

#### **UNIT – IV: Laplace Transforms**

Laplace Transforms – Definition – Properties of Laplace transforms– Periodic functions – Laplace transforms of elementary functions – Problems. (Chapter:7 Section :1 to 3, Page :7.1 to 7.23).

**UNIT – V: Inverse Laplace transforms**

Inverse Laplace transforms – Standard formulae – Elementary Theorems – Solving differential Equation using Laplace transforms and Solving Simultaneous linear differential equations. (Chapter: I Section:1.7 to 1.15, Page :1.21 to 1.56 and Section:1.18 to 1.2, Page :1.65 to 1.88).

**Text Books**

1. Dr. M.K. Venkatraman, Mrs. Manorama Sridhar, Differential Equations and Laplace Transformations, The National Publishing Company, 2010.(UNIT-I,II,III,V).
2. P.R.Vittal [2004], Differential Equations and Laplace Transform, Margham Publications, Chennai, (UNIT-IV).

**Reference Books**

1. S. Narayanan, Differential Equations and Laplace Transformations, Vijay Nicole Imprints Pvt. Ltd., C – 7, Nelson Chambers, 115 Nelson Manickam Road, Chennai – 600 029, 2004.
2. K.Sankar Rao - Introduction to Partial Differential Equations Prentice Hall India – New Delhi, 1997.
3. Dr.J.K. Goyal and K.P.Gupta, Laplace and Fourier Transforms, Pragali Prakashan Publishers, Meerut, 2000.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Solve the first order differential equations through various techniques.	K1
CO2	Learn the methods for solving Linear Differential Equations with constant and variable coefficients.	K2
CO3	Evaluate the partial differential equations of first order using different methods.	K3
CO4	Understand the basic concepts of Laplace and Inverse Laplace Transforms.	K4
CO5	Apply Laplace and Inverse Laplace transforms to solve the ordinary differential equations.	K5

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core – V		Course Code:21UMA3C05		Course Title: Real analysis-I
Semester III	Hours/Week 6	Total Hours 90	Credits 5	Total Marks 100

### Course Objectives

1. To know about the concepts of sequences and series of real numbers.
2. To study about the binomial theorem, Exponential theorem and Logarithmic Series.

#### **UNIT – I: Sequence of real numbers**

Definition – Sequence and subsequence – Limit of a sequence – Convergent sequence – Divergent of sequences – Bounded sequences – Monotone sequences – Operations on convergent sequences(Chapter 2:Section 2.1 - 2.7 pages 24-44).

#### **UNIT – II: Series of real numbers**

Operations on divergent sequences – Limit superior and Limit Inferior – Cauchy sequences – Convergence and Divergence of series – Series with nonnegative terms – Alternating series – Conditional convergence – Absolute convergence. (Chapter 2: Section 2.8 – 2.10 &Chapter 3: 3.1 - 3.4 pages 44-55, 67-75 ).

#### **UNIT – III: Series of real numbers (continuation)**

Rearrangement of series – Tests for absolute convergence – Series whose terms form a non increasing sequence – Summation by parts (Chapter 3: section 3.5 – 3.8 Pages 76-90).

#### **UNIT –IV: Binomial theorem**

Vandermonde's Theorem - Binomial theorem for rational index with proof – Summation and approximation (Chapter 3: section 4, 5, 10, 14 Pages 123-127,143-152,168-179).

#### **UNIT – V: Exponential and Logarithmic series**

Exponential and Logarithmic series with proof – Summation of series using the above two theorems and approximation. (Chapter 4: section 1 – 11Pages 188-237).

**Text Books**

1. Richard R. Goldberg, Methods of Real Analysis – Oxford and IBH Publishing Co.Pvt.Ltd., New Delhi. (for UNIT I,II,III).
2. T.K.ManicavasagamPillai, Natarajan and Ganapathy, Algebra, Vol.1, S.Viswanathan (Printers & Publications) Pvt.Ltd.,. (for UNIT IV,V).

**Reference Books**

1. Tom. M. Apostol, Mathematical Analysis, 2nd ed., Narosa Publishing Company, Chennai, 1990.
2. Dr. S. Arumugam, Sequence and Series, New Gamma Publishers, 1999.
3. M. K. Singal and Asha Rani Singal,A first course in Real Analysis, R.Chand and Co Ltd.,1999.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Define and illustrate the intervals in $\mathbb{R}$ , Bounded sets, Monotone sequences and sequence and verify the given Sequences in Convergent and Divergent by using behavior of monotonic sequences.	K1
CO2	Find Limit points and Upper and lower limits of a sequence. Prove theorems on different test of convergence and divergence of series.	K1&K2
CO3	Remembering Series of real numbers.	K3& K4
CO4	Calculate Binomial Series,	K4&K5
CO5	Calculate Exponential Series and the Logarithmic Series	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**





Program: B.Sc. Mathematics				
Core – VI		Course Code:21UMA3C06		Course Title: Mechanics
Semester III	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### Course Objectives

To introduce the study of the forces acting at a point and to provide a basic knowledge of parallel forces and projectiles objects in motion.

#### **UNIT I: Forces Acting at a Point**

Resultant and components: Definition-Simple cases of finding resultant–Law of parallelogram of forces – Lami’s theorem – Problems.(Chapter II: Sec 1-9 Pages 6-26).

#### **UNIT II: Parallel Forces and Moments**

Like parallel forces–Unlike parallel forces– Moments of a force – Varignon’s theorem of moments –Generalized moments of a force-problems. (Chapter III: Sec Pages 1-13 Pages 52-70).

#### **UNIT III: Projectiles**

Projectiles – Path of a projectile – Time of flight – Horizontal range – range on inclined plane-Motion on the surface of a smooth inclined plane-Problems. (Chapter VI:Sec 6.1-6.7&6.12-6.16 Pages 139-156,172-182).

#### **UNIT IV: Simple Harmonic Motion**

Definition of S.H.M. – Geometrical representation of S.H.M. – Composition of S.H.M. of the same period and in the same line – Composition of S.H.M’s of the same period in two perpendicular directions. (Chapter X Sec 10.1-10.7 Pages 309-330).

#### **UNIT V: Motion Under the action of central forces**

Radial and transverse components of velocity and acceleration – Differential equation of a central orbit – Given the orbit to find the law of force – Given the law of force to find the orbit(Chapter XI: Sec 11.1-11.13 Pages 356-397).



### Text Books

1. M.K. Venkataraman, Statics, Agasthiar Publications, 2007.(UNITs I & II).
2. M.K. Venkataraman, Dynamics, Agasthiar Publications, 2009.(UNITs III, IV & V).

### Reference Books

1. K. ViswanathNaik, M. S. Kasi, Statics, Emerald Publishers, 1992.
2. K. ViswanathNaik, M. S. Kasi, Dynamics, Emerald Publishers, 1992.
3. Dr.P.P.Gupta, Statics, Kedarnath Ram Nath, Meerut,1983-84.
4. P. Duraipandian and LaxmiDuraipandian, Mechanics, S.Chand and Company Ltd, Ram Nagar, New Delhi-55, 1985.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Define Force and Newton's Laws of motion and Forces on a rigid body.	K1
CO2	Derived Parallel Forces and Moments.	K1&K2
CO3	Derive Projectiles and Path of a projectile.	K2& K3
CO4	Define Simple Harmonic Motion andComposition of S.H.M's.	K4&K5
CO5	Describe Radial and transverse components of velocity and acceleration.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

S – Strong

M – Medium

L – Low



Program: B.Sc. Mathematics				
Core – VII		Course Code:21UMA4C07		Course Title: Real Analysis – II
Semester IV	Hours/Week 6	Total Hours 90	Credits 5	Total Marks 100

### Course Objectives

1. Gain knowledge about connected sets, compact metric spaces, totally bounded sets and complete metric spaces.
2. To enable to know about the convergence and uniform convergence of sequence of functions and related theorems.
3. Discuss the concepts of the Riemann integral, existence of Riemann integral and properties of Riemann integral.
4. Understand the concepts of derivatives and fundamental theorem of calculus.
5. Develop the ability to reflect, critically on the methods they have chosen to solve problems.

#### **UNIT I: Continuous functions on metric spaces**

Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space 1 – open sets – closed sets – Discontinuous functions on  $\mathbb{R}$ . (Chapter 5: Sections 5.1 to 5.6 Pages 113-132).

#### **UNIT II: Connectedness, Completeness, and Compactness**

Connected sets – bounded sets and totally bounded sets – complete metric space-Compact metric spaces – continuous functions on compact metric spaces.(Chapter 5: Sections 6.2 to 6.6 Pages 134-150).

#### **UNIT III: Calculus**

Sets of measure zero – definition of the Riemann integral – Existence of the Riemann integral – Properties of the Riemann integral.(Chapter 7: Sections 7.1 to 7.4 Pages 156-170).

#### **UNIT IV: Calculus (Continued)**



Derivatives – Rolle’s Theorem – The law of the mean – Fundamental theorem of calculus.  
(Chapter 7: Sections 7.5 to 7.8 Pages 170-189).

### **UNIT V: Sequences and Series of functions**

Point wise convergence of sequences of functions – uniform convergence of sequences of functions – consequences of uniform convergence – convergence and uniform convergence of series of functions.(Chapter 9: Sections 9.1 to 9.4 Pages 231-247).

#### **Text Book**

Richard R. Goldberg, Methods of Real Analysis – Oxford and IBH Publishing co, Pvt. Ltd.,  
New Delhi.

#### **Reference Books**

1. D.Somasundaram and B.Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, Third Reprint, 2007.
2. Tom. M. Apostel, Mathematical Analysis, Narosa Publications, New Delhi, 2002.
3. V.Karunakaran, Real Analysis, Pearson Publication, India, 2011.

#### **E-learning Source**

<http://www.acadiau.ca/~hteisman/3533notes.pdf>



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Discuss Continuous functions on metric spaces.	K1
CO2	Discuss Connectedness, Completeness, and Compactness.	K1&K2
CO3	Describe Sets of measure zero, Riemann integral and properties.	K2& K3
CO4	Illustrate Derivatives and verifying theorems.	K3&K4
CO5	Describe Sequences and Series of functions.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

S – Strong

M – Medium

L – Low



Program: B.Sc. Mathematics				
Core – VIII		Course Code:21UMA4C08		Course Title: Graph theory
Semester IV	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

### Course Objectives

1. Acquire the basic knowledge of various types of graphs.
2. Know about the problem-solving power of the graph theory.
3. Know about the applications of graphs to simple situations and puzzles.

#### **UNIT – I: Graphs and Sub graphs**

Introduction – Definition – Examples – Degrees – Definition – Theorem 1, 2 – Problems – Sub graphs – Definition – Theorems – Operations on graphs – Definition theorem–1 – Problems. (Chapter 2: Sections 2.0 – 2.3 and 2.9, Page No: 5-13 & 25-27).

#### **UNIT – II: Connectedness**

Introduction – Walks, Trails and Paths – Definitions Theorem–1,2,3 – Connectedness and Components –Definitions – Theorems – Definition – Distance – Theorems – Cut point – Bridge –Connectivity. (Chapter 4: Sections 4.0 – 4.2 and 4.4, Page No: 34-41 & 45, 46).

#### **UNIT – III: Eulerian and Hamiltonian Graphs**

Introduction – Eulerian Graphs – Definition – Lemmas – Theorem – Konigsberg Bridge problem –Fleury's Algorithms – Hamiltonian graphs – Definitions - Theorems – Lemma – Closure – Theorems. (Chapter 5: Sections 5.0 – 5.2, Page No: 48-57).

#### **UNIT – IV: Trees**

Introduction – Characterization of Trees – Theorems – Centre of a tree – Definition – Theorem. (Chapter 2: Sections 6.0 – 6.2, Page No: 61-65).

#### **UNIT – V: Directed Graphs**

Introduction – Definition – Basic properties definitions – Theorems – Paths and connections – Theorems– Definition – Diagraphs and matrices – Definitions – Theorems. (Chapter 10: Sections 10.0 – 10.3, Page No: 99-109).

**Text Book**

S.Arumugam, S.Ramachandran, Invitation to Graph theory, Scitech Publications, Chennai, 2001.

**Reference Books**

1. John Clark and Derek Allan Holton, A First Book at Graph Theory, Allied Publishes,.
2. S.Kumaravelu and Susheela Kumaravelu , Graph Theory, Publishers Authors C/o.182, Chidambara Nagar, Nagarkoil– 629 002.
3. Introduction To Complex Analysis.S. Ponnuswamy, Narosa Publishers 1993.

**E-learning Source**

1. <http://nptel.ac.in/courses/111106050/>
2. <https://cs.bme.hu/fcs/graphtheory.pdf>

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the origin of graph theory.	K1
CO2	Illustrate different types of graph.	K1&K2
CO3	Discuss Operations on Graphs on Hamiltonian Paths and circuits.	K2& K3
CO4	Define Trees, fundamental circuits, cut sets, Connectivity and Separability.	K4&K5
CO5	Describe Paths and connections.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**





**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core – IX		Course Code:21UMA5C09		Course Title: Abstract Algebra
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	5	75	5	100

### Course Objectives

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.
6. Studying the rings and their properties.

### **UNIT – I: Group Theory**

Group – Definition – Examples – Some Preliminary lemmas – Problems – Subgroups – definition – lemmas – Cosets – definition – theorems – Lagrange’s Theorem – order of an element – Euler Theorem – Fermat Theorem. (Chapter 2: Sections 2.1-2.4, pages: 26-44).

### **UNIT – II: Group Theory (Continuation)**

A Counting Principle – Normal Sub Groups – Definition – Properties – Problems – Quotient groups – Definitions – Lemma. (Chapter 2: Sections 2.5-2.6, pages: 44-54).

### **UNIT – III: Group Theory (Continuation)**

Homomorphism – Definition – Examples - Lemmas - Kernel of a homomorphism – Fundamental theorem – Automorphism – Definition – Inner Automorphism – Lemmas – Examples – Cayley’s Theorem. (Chapter 2: Sections 2.7-2.9, pages: 54-74. (Except application 1, 2 & 3)).

**UNIT – IV: Ring theory**

Ring – Definition – Examples – some special classes of Rings – Zero Divisor – Integral Domain - Field - Definition – Examples - Ideals – Quotient Rings – Maximal ideal. (Chapter 3: Sections 3.1-3.2 & 3.4-3.5, pages: 120-130 & 133-140).

**UNIT – V: Ring theory (Continuation)**

The Field of Quotient of an Integral Domain – Euclidean Rings – Definition – Principal ideal Ring – Greatest common divisor – Properties – Unique factorization theorem (Chapter 3: Sections 3.6-3.7, pages: 140-149).

**Text Book**

I.N. Herstein, Topics in Algebra, John Wiley, New York, 1975.

**Reference Books**

1. M.L. Santiago, Modern Algebra, Tata McGraw Hill, New Delhi, 1994.
2. K. Viswanatha Naik, Modern Algebra, Emerald Publishers, 135, Anna Salai, Chennai, 1988.
3. A.R. Vasistha, A first course in Modern Algebra, Krishna Prekasan Mandhir, 9, Shivaji Road, Meerut (UP), 1983.
4. Dr. R. Balakrishnan and Dr. N. Ramabadrana, A Text Book of Modern Algebra, Vikas Publishing House, New Delhi, 1994.

**E – Learning Sources**

1. <http://mathworld.wolfram.com>
2. <http://www.math.uconn.edu/~kconrad/blurbs/grouptheory/coset.pdf>
3. <http://www3.ntu.edu.sg/home/Frederique/chap2.pdf>



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Use technological tools such as computer algebra systems or graphing calculators for visualization and calculation of algebraic concepts. Recognize the concepts of the terms Groups, subgroups.	K1
CO2	Recognize the concepts of the terms Normal Subgroups and Quotient group.	K2 & K3
CO3	To learn the concepts of isomorphism and homomorphism for groups. Extend group structure to finite permutation groups (Cayley's Theorem)	K4
CO4	Define Rings, Subrings, Ideals, Quotient rings Field of quotients of an integral domain.	K4 & K5
CO5	Discuss the Unique Factorization Domain, Euclidean domain, PID	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



**Program: B.Sc. Mathematics**

<b>Core – X</b>		<b>Course Code:21UMA5C10</b>		<b>Course Title: Complex Analysis</b>	
<b>Semester</b> V	<b>Hours/Week</b> 6	<b>Total Hours</b> 90	<b>Credits</b> 5	<b>Total Marks</b> 100	

**Course Objectives**

1. To introduce the theory of complex variable this is different from analysis of real variable.
2. Upon completing this course the students will be able to use C-R equations to test for analyticity and compute a derivative, work with standard complex functions.
3. To learn the properties of complex valued function defined on the set of complex numbers.
4. To introduce the concept of an analytic function, bilinear transformations.

**UNIT I: Complex Number System**

Complex number system – Complex number –Field of Complex numbers –Scalar multiplication of a complex number – Conjugation –Absolute value of a complex number – Infinity and extended complex plane – Stereographic projection.(Chapter 1: Sections : 1.1 to 1.3, 1.6,1.7; Chapter 2 : Sections : 2.7,2.8; Page No:1-5,22-23).

**UNIT II: Analytic Functions**

Complex functions – Limit of a function –continuity of a function –Uniform continuity–differentiability and Analyticity of a function –necessary conditions for differentiability – sufficient conditions for differentiability –Cauchy-Riemann equation in polar coordinates – Complex function as a function of  $Z$  and  $\bar{Z}$ .–Examples. (Chapter 4: Sections: 4.1 to 4.10 Page No:39-63).

**UNIT III: Power series and Elementary Functions**

Power Series –Absolute convergence –Uniform of convergence –Analyticity of the sum of power series – Elementary functions: Exponential, Logarithmic, Trigonometric, Harmonic functions–Examples. (Chapter 6: Sections: 6.1 to 6.4, 6.6-6.8, 6.10, 6.12, 6.13, Page No: 80-102).

**UNIT IV: Elementary and Conformal mappings**

Bilinear Transformation–Special Bilinear transformation–circles and inverse points. (Chapter 7: Sections: 7.1 to 7.3, Page No: 103-116).

**UNIT V: Elementary and Conformal mappings (Continuation)**

Transformation of  $w = z^2$ ,  $w = Z^{1/2}$ ,  $w = e^z$ ,  $w = \sin z$ ;  $w = \cos z$ ,  $w = \sinh z$ ;  $w = \cosh z$ , Conformal Mapping – Examples. (Chapter 7: Sections : 7.4 to 7.9, Page No.:116-132).

**Text Book**

P. Duraipandian and Laxmi Duraipandian, Complex Analysis, Emerald Publishers, Chennai –2, 1986.

**Reference Books**

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd., 1974.
2. Santhinarayan, Theory of functions of Complex Variable, S.Chand and Company, Meerut, 1995.
3. Tyagi B.S. Functions of Complex Variable, 17<sup>th</sup> Edition, and PragatiPrakasham Publishing Company Ltd., Meerut, 1992-93.

**E-Learning Sources**

1. <https://www.math.lsu.edu/~neubrand/notes.pdf>
2. <http://www.iitg.ac.in/physics/fac/charu/courses/ph503/book.pdf>
3. <https://www.math.ucdavis.edu/~romik/data/uploads/notes/complex-analysis.pdf>

**Note:** Questions to be taken only from the Text Book.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	To study basic complex number system and Stereographic projection.	K1
CO2	Understanding and significance of Limits, Continuous functions. Differentiability for complex function and be familiar with the CR-equation.	K2 & K3
CO3	Discuss Power series and Elementary Functions.	K4
CO4	Define Conformal Mapping, Bilinear transformations, Cross ratio and Fixed points.	K4 & K5
CO5	Transformation of $w = z^2$ , $w = Z^{1/2}$ , $w = e^z$ , $w = \sin z$ ; $w = \cos z$ , $w = \sinh z$ ; $w = \cosh z$ .	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core – XI		Course Code:21UMA5C11		Course Title: Mathematical Statistics – I
Semester V	Hours/Week 5	Total Hours 75	Credits 5	Total Marks 100

### Course Objectives

1. To develop the statistical concepts and introduce the techniques of analysis and inference used for research in social and life sciences.
2. To make the students gain wide knowledge in probability this plays a main role in solving real life problems.
3. Know the definition and properties of standard Binomial and Normal distributions and their applications in analyzing data.
4. Know methods of finding correlation and regression coefficients between two data sets and their applications.

### **UNIT I: Probability**

Axiomatic Approach to Probability – Random experiment, Sample space and elementary events – Algebra of events – Some Theorems on Probability – Multiplicative Theorem of Probability - Independent Events - Multiplicative Theorem of Probability for independent Events – Baye’s Theorem. (Chapter 3: Sections 3.8 (3.8.1, 3.8.2, 3.8.5, 3.8.6), Sections 3.9 (3.9.1, 3.9.2, 3.9.3(Omit Problems)), Sections 3.10 -3.13, Chapter 4 Sections 4.2).

### **UNIT II: Mathematical Expectations**

Introduction – Mathematical Expectation or expected value of a random variable – Expected value of functions of a random variables – Properties of expectation – properties of variance – Moment generating function – Cumulants – Properties of Cumulants – Properties of Characteristics of functions – Tchebechev’s inequality – Covariance. (Chapter 6: Sections 6.1-6.6, Chapter 7: Sections 7.1, 7.2, 7.3 (7.3.1), 7.5).

### **UNIT III: Correlation**





Introduction – Types of correlation – Methods of studying correlation – Karl Pearson's coefficient of correlation - Rank Correlation. Regression: Introduction – Regression lines – Regression Equations. (Chapter 10 Page 390-405, 416-422, 452-467)

#### **UNIT IV Binomial Distribution**

Moments of Binomial Distribution – Recurrence Relation for the Moments of Binomial Distribution – Mean Deviation about Mean of Binomial Distribution – Mode of Binomial Distribution – MGF of Binomial Distribution – Additive Property – Characteristic Function – Cumulants of the Binomial Distribution. Poisson Distribution: The Poisson Process – Moments – Mode – Recurrence Relation – MGF – Characteristic Function – Cumulants – Additive property. (Chapter 8 Sections 8.4(8.4.1, 8.4.2, 8.4.4 - 8.4.9) 8.5(8.5.1 – 8.5.8)).

#### **UNIT V: Normal Distribution**

Introduction – Mode – Median – MGF – Cumulant generating function – Moments – Points of inflexion – Mean deviation about mean. (Chapter 9 Sections 9.1, 9.2 (9.2.3 – 9.2.7, 9.2.9 – 9.2.10)).

#### **Text Books**

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi -2, 2011 (For Units I, II, IV, V).
2. S.P.Gupta, Statistical Methods, Sultan Chand and Sons, New Delhi -2, 2011.(For Unit III).

#### **Reference Books**

1. R.S.N. Pillai and V.Bagavathi, Statistics, Sultan Chand, New Delhi, 2008.
2. Gupta S.P, Statistical Methods, Sultan Chand, New Delhi, 33rd Edition, 2005.

#### **E-Learning Source**

1. <http://mathword.wolfram.com>



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Discuss classical probability, empirical probability and axiomatic approach towards probability.	K1
CO2	Discuss Mathematical Expectation, Cumulants and Tchebechev's inequality.	K2 & K3
CO3	Understand the concept of Bivariate distribution of Correlation and Regression.	K4
CO4	Understand the Binomial and Poisson distributions of Moments and Moment generating Function.	K5
CO5	Describe Normal distribution of Moment generating Function.	K5 & K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Major Elective-I		Course Code:23UMAME03		Course Title: Optimization Techniques
Semester	Hours/Week	Total Hours	Credits	Total Marks
IV	5	75	3	100

### Course Objectives

1. To know the origin and development of Operations Research.
2. To introduce the field of operations research which has many applications in management techniques.
3. To develop the skills of formulation of LPP and different techniques to solve it.
4. To know the application of Transportation and Assignment problems.
5. To study the optimizing problems in Game theory, Networking and Inventory control.

#### **UNIT – I Operations Research**

Operations Research Models–Solving the OR Model–Queuing and Simulation Models–Art of Modeling–More than Just Mathematics–Phases of OR Study–Two-variables LP Model–Graphical LP Solution–Solution of Maximization Model–Solution of Minimization Model. (Chapter 1: Sections 1.1 to 1.6 and Chapter 2: Sections: 2.1-2.2, Page No: 1-10 and 11-25).

#### **UNIT – II The Simplex Method**

LP Model in Equation form-Transition from Graphical to Algebraic solution–The Simplex Method-Special case in Simplex Method. (Chapter 3: Sections 3.1 to 3.3 and 3.5, Page No: 82-99 and 113-122).

#### **UNIT – III Transportation Model and its Variations**

Definition of the Transportation Model– Nontraditional Transportation Models–The Transportation Algorithm–The Assignment Model–The Transshipment Model. (Chapter 5: Sections 5.1-5.3, Page No: 193-215 and 221-230).

#### **UNIT – IV Network Models**

Scope and Definitions of Network Models–Spanning tree algorithm-Shortest route problem–CPM and PERT. (Chapter 6: Sections 6.1, 6.2, 6.3, 6.3.1-6.3.2 and Sections: 6.5.1-6.5.5, Page No: 236-250 and 275-295).

**UNIT – V Decision Analysis and Game Theory**

Decision making under certainty– Decision making under risk– Decision making under uncertainty- Game theory. (Chapter 13: Sections: 13.1-13.4.2, Page No: 489-529).

**Text Book**

Hamdy A. Taha, Operations Research (8th Edn.), McMillan Publishing Company, New Delhi, 2007.

**Reference Books**

1. Kantiswarup, P. K. Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Reprint 2013.
2. S. Kalavathy, Operations Research, Vikas Publishing House Pvt. Ltd., 5<sup>th</sup> Edition, 2006.
3. P.K Gupta, Problems in Operations Research, 2-e, S.Chand & Sons, New Delhi, 1983.
4. R. Pannerselvam, Operations Research, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
5. S. D. Sharma, Operations Research, Kedar Nath Ram Nath and Co., Meerut, 1998.

**E–Learning Sources**

1. [http://cs.bme.hu/fcs/operations\\_research.pdf](http://cs.bme.hu/fcs/operations_research.pdf)
2. <https://books.google.co.in/books?id=wYfxfB62NUC&pg=PA229&dq=elective+ii+operations+research&hl=en&sa=X&ved=0ahUKEwiCiMLrt4nbAhWXTX0KHcydACAQ6AEIKAB#v=onepage&q=elective%20ii%20operations%20research&f=false>
3. [http://rajkumar2850.weebly.com/uploads/1/4/9/8/14980396/transportation\\_and\\_assignment\\_problems\\_2014.pdf](http://rajkumar2850.weebly.com/uploads/1/4/9/8/14980396/transportation_and_assignment_problems_2014.pdf)
4. <http://www.personal.psu.edu/cxg286/Math486.pdf>
5. [http://www.math.upatras.gr/~tsantas/DownloadFiles/Hillier&Lieberman\\_7thedition\\_Chapter10.pdf](http://www.math.upatras.gr/~tsantas/DownloadFiles/Hillier&Lieberman_7thedition_Chapter10.pdf)



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	To know the field of operations research this has many applications in management techniques.	K1
CO2	To know the skills of formulation of LPP and different techniques to solve it.	K2 & K3
CO3	To know the application of Transportation and Assignment problems.	K2 & K4
CO4	Definitions of Network Models, Spanning tree algorithm, Shortest route problem, CPM and PERT.	K5
CO5	To describe decision making under certainty.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



**Program: B.Sc. Mathematics**

<b>Major Elective</b>		<b>Course Code:21UMA5CE02</b>		<b>Course Title: Number Theory</b>	
<b>Semester</b> V	<b>Hours/Week</b> 5	<b>Total Hours</b> 75	<b>Credits</b> 4	<b>Total Marks</b> 100	

**Course Objectives**

1. To highlight the niceties and nuances in the world of numbers.
2. To prepare the students for coding through congruence.
3. Know about the basic concepts of number theory.
4. Get a complete grip of various concepts to present modern Mathematics in elementary terms.
5. Develop the skill of solving problems in number theory.

**Unit – I**

The Division Algorithm – The g.c.d. – The Eucliden Algorithm – The Diophantine  $ax + by = c$ .

**Unit – II**

The Fundamental Theorem of arithmetic, the sieve of Eratosthenes – The Goldbach conjecture – basic properties of congruence.

**Unit – III**

Special Divisibility tests – Linear congruences – The little Fermat's theorem – Wilson's Theorem.

**Unit – IV**

The Functions  $\mu$  and  $\phi$  the Mobius inversion Formula – The Greatest integer function.

**Unit – V**

Euler's Phi–Function – Euler's Theorem – Some Properties of the Phi – Function.

**Text Book**

David M. Burton, 2001, Elementary Number Theory, Universal Book Stall.

**Reference Books**

1. Elementary Theory of Numbers, cy. Hsiung, Allied Publishers, 1995.



2. Elementary Number Theory, Allyn and Bacon Inc., Boston, 1980.
3. Introduction to Analytic Number Theory, Tom.M.Apostol, Narosa Publishing House, New Delhi, 1989.

### E-Learning Source

1. <http://www2.math.uu.se/~lal/kompendier.pdf>

**Note:** Questions to be taken only from the text books

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the Division Algorithm and the Diophantine Equation $ax+by=c$ .	K1
CO2	To discuss The Fundamental Theorem of arithmetic, the sieve of Eratosthenes – The Goldbach conjecture.	K2 & K3
CO3	To describe Linear congruences – The little Fermat's theorem – Wilson's Theorem.	K3 & K4
CO4	Derive the Functions $\mu$ and $\phi$ the Mobius inversion Formula	K5
CO5	Discuss Euler's Phi-Function and Euler's Theorem	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

S – Strong

M – Medium

L – Low



Program: B.Sc. Mathematics				
Major Elective-II		Course Code:21UMA5CE03		Course Title: Numerical Methods
Semester V	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### Course Objectives

1. To develop skills in solving problems using numerical techniques.
2. This course covers the techniques of Numerical Differentiation and Numerical Integration.
3. It also deals with solution of difference equations, Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order.

#### **UNIT –I: Solution of Algebraic and Transcendental Equations**

Introduction - Graphical Solution of equations - Method of bisection – The iteration method – Newton Raphson method – Generalized Newton’s Method for multiple roots – Regula – Falsi method – Muller’s method. (Chapter -2, Sections 2.1 to 2.8), (Pages 19-59).

#### **UNIT –II: Interpolation with Equal and Unequal intervals**

Introduction – Missing Values – Newton’s binomial expansion formula – Newton’s forward interpolation formula – Newton – Gregory backward interpolation formula–Error in the interpolation formula – Newton’s general divided differences formula – Lagranges interpolation formula – Inverse interpolation.( Chapter 4&5 , Sections 4.1 to4.6 & 5.2 to 5.4), (Pages 96-132).

#### **UNIT –III: Central Difference Interpolation Formulae**

Introduction – Gauss’s forward interpolation formula – Gauss’s backward interpolation formula – Bessel’s formula – Stirling’s formula – Laplace – Everett’s formula.(Chapter 6, Section6.1 to 6.6), (Pages 140-156).

#### **UNIT –IV: Numerical Differentiation and Integration**

Introduction – Derivatives using Newton’s forward interpolation formula – Derivatives using Newton’s backward interpolation formula – Derivatives using stirling’s formula – Trapezoidal





rule – Simpson’s one-Third rule – Simpson’s three-eighth’s rule – Weddle’s rule.(Chapter 8 & 9, Sections 8.1 to 8.4 & sections 9.3 to 9.6),( Pages 170-183 & 186 to 198).

### **UNIT –V: Numerical Solution of ordinary Differential Equations**

Introduction – Taylor’s series method – Euler’s method – Modified Euler’s method – predictor - corrector method – Milne’s method – Adams – Bash forth – Moulton method – Runge – Kutta method – Picard’s method of successive approximation.(Chapter 10, Sections 10.1 to 10.9), (Pages 218-253).

#### **TextBook**

G.ShankerRao,Numerical Analysis, New age International Publishers New Delhi Fourth Edition.

#### **Reference Books**

- 1.Balagurusamy,Numerical Methods, Tata Me Graw Hill publishing Company Ltd, New Delhi, 2002.
2. S.S.Sastry, Introductory Method of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
- 3.T.K.Manickavasagam and Narayanan S.Viswanathan& Co., Engineering NumericalMethods, Chennai 1998.

#### **E-Learning Sources**

- 1.<http://nptel.ac.in/courses/122102009/>
2. <http://www.math.ust.hk/~machas/numerical-methods.pdf>

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Compute the Solution of Algebraic and Transcendental equation using Bisection, Iteration, Method of false position and Newton Raphson Method.	K1
CO2	Solve Interpolation of Finite differences – Newton’s Forward, Central and Backward differences	K2 & K3
CO3	Solve Bessel’s formula – Stirling’s formula – Laplace – Everett’s formula.	K3 & K4
CO4	Obtain the Numerical differentiation and integration. Derive Trapezoidal and Simpson’s Rule.	K4 & K5
CO5	Derive and compute the solution of Taylor series, Picard’s and Euler method and Runge–Kutta Methods.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

S – Strong

M – Medium

L – Low



Program: B.Sc. Mathematics				
Major Elective		Course Code:21UMA5CE04		Course Title: Combinatorial Mathematics
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	5	75	4	100

### Course Objectives

Combinatorial mathematics is the study of the arrangements of objects, according to prescribed rules, to count the number of possible arrangements or patterns, to determine whether a pattern of a specified kind exists and to find methods of constructing arrangements of a given type.

#### **UNIT I**

Permutations and Combinatory: The Rules of sum and product–Permutations–Combinations – Distributions of distinct objects–Distribution of non-distinct objects–Stirling’s formula.(Chapter 1. section 1.1 – 1.7. Page number 1 to 15).

#### **UNIT II**

Generating Functions Generating functions for combinations – Enumerators for permutations Distributions of distinct objects into non distinct cells – Partitions of integers – The Ferrers graph – Elementary relations. (Chapter: 2 Section 2.1 – 2.7. Page number: 24 to 46).

#### **UNIT III**

Recurrence relations Linear recurrence relations with constant coefficients – Solution by the technique of generating functions – A special class of nonlinear difference equations – Recurrence relations with two indices. (Chapter: 3 Section 3.1 – 3.5. Page number : 58 to 80).

#### **UNIT IV**

The Principle of inclusion and exclusion 31 The Principle of inclusion and exclusion – The general formula – Derangements – Permutations with restrictions on relative positions – The rook polynomials – Permutations with forbidden positions. (Chapter: 4 Section 4.1 – 4.7. Page number : 96 to 115).

#### **UNIT V**



Polya's theory of counting Sets, relations and groups – Equivalence classes under a permutation group – Equivalence classes of functions – Polya's fundamental theorem – Generalization of Polya's theorem.(Chapter:5 Section 5.1 – 5.7. Page number: 126 to 154).

### Text Book

C.L. Liu, Introduction to Combinatorial Mathematics, McGraw Hill Book Company, New York, 1968.

### Reference Books

1. Murray Edelberg and C.L. Liu, Solutions to Problems in Introduction to Combinatorial Mathematics, MC Graw-Hill Book & Co., New York, 1968.
2. R.P. Stanley, Enumerative Combinatorics, Volume I, 2nd Edition, Cambridge Studies in Advanced Mathematics (Book 49), Cambridge University Press, 1997.
3. P.J. Cameron, Combinatorics: Topics, Techniques, Algorithms, Cambridge University Press, Cambridge, 1998.
4. Miklos Bona, A Walk through Combinatorics, World Scientific Publishing Company, 2002.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Permutation, with and without repetitions, combinations, with and without repetitions. Apply counting strategies to solve discrete probability problems.	K1
CO2	To describe Generating Functions Generating functions for combinations.	K2 & K3
CO3	To solve Linear recurrence relations with constant, A special class of nonlinear difference equations and Recurrence relations with two indices.	K4
CO4	Derive Inclusion-exclusion principle.	K5
CO5	Discuss Polya's theory of counting Sets, relations and groups.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Skilled Based Elective Course-I		Course Code:21UMA5S01		Course Title: C-Programming
Semester	Hours/Week	Total Hours	Credits	Total Marks
V	2	30	2	100

### Course Objectives

1. The course is designed to provide complete knowledge of C language.
2. Students will be able to develop logics which will help them to create programs, applications in C.
3. Also by learning the basic programming constructs they can easily switch over to any other language in future.

### **UNIT – I Constants, Variables and Data Types**

Introduction – Character set – Constants – Keywords and Identifiers – Variables – Data Types – Declaration of Variables – Assigning values to variables – Defining symbolic Constants. (Sections: 2.1 to 2.8, 2.10, 2.11) Page No. : 22 to 33 and 38 to 43.

### **UNIT – II Operators and Expressions**

Arithmetic operators – Relational operators – Logical operators – Assignment operators – Increment and Decrement operators – conditional operators – Special operators. Arithmetic expressions – Evaluation of Expressions. (Sections 3.2 to 3.7, 3.9, 3.10, 3.11) Page No.: 51 to 59 & 60 to 62.

### **UNIT – III Managing Input and output operations**

Reading a character – Writing a character – Formatted input and output.

**Decision making and Branching:** Decision making with IF Statement – Simple IF Statement – IF ELSE Statements – Nesting of IF ...ELSE Statement – ELSE IF Ladder - Switch Statement – The?: Operator – GOTO Statement. (Sections 4.2 to 4.5 and 5.2 to 5.9) Page No.: 81 to 94 & 110 to 132.

### **UNIT – IV Decision Making and Looping**

WHILE Statement – Do Statement – FOR Statement – Jumps in Loops – Simple Programs. (Sections 6.2 to 6.5) Page No.: 147 to 159.

**UNIT – V Arrays, Character Arrays and String**

Introduction – One Dimensional array – Declaration of one and two dimensional arrays – Initiating of one and two dimensional arrays-Declaring and initializing string variables – Reading strings from terminal – writing sting on the screen–Arithmetic operations on characters – simple problems. (Sections 7.1 to 7.6, 8.1 to 8.5) Page No: 180 to 193 & 217 to 228.

**Text Book**

E. Balagurusamy, Reprint 2005, Programming in ANSI C, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup>Edition.

**Reference Books**

1. Peter Aitken and Bradley L Jones, Teach Yourself C in 21 Days, Tech Media, New Delhi, 4<sup>th</sup>Edition..
2. Tony Zhang, Teach Yourself, C in 24 Hours, Sams Publications, 1<sup>st</sup>Edition, 1997.
3. Ram Kumar and RakashAgrawal, Programming in ANSI C, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1993.

**Note:** This paper should be handled and valued by the faculty of Mathematics only.

**E-Learning Source**

1. <https://www.edx.org/learn/c-programming>
2. <http://www.plantation-reductions.com/Webster/www.artofasm.com/Linux/PDFs/ConstsVarsAndDataTypes.pdf>
3. [http://www.lessons2all.com/c\\_decision\\_making\\_looping.php](http://www.lessons2all.com/c_decision_making_looping.php)

**Note:** Questions to be taken only from the Text Books.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Describe Constants, Variables and Data Types, Character set, C tokens.	K1
CO2	Define Operators and character.	K1 & K2
CO3	Describe Decision making and Branching.	K3
CO4	Understand Decision making statements and loop structures in C	K4
CO5	Define Strings and Arrays.	K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

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

S – Strong

M – Medium

L – Low





Program: B.Sc. Mathematics				
Skilled Based Elective Course-II		Course Code:21UMA5SP01		Course Title: C-Programming Practical
Semester V	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Objectives

1. The course is designed to provide complete knowledge of C language.
2. Students will be able to develop logics which will help them to create programs, applications in C.
3. Also by learning the basic programming constructs they can easily switch over to any other language in future.

### **Write C program for the following**

1. To Find the sum of N numbers.
2. To Find the Largest of given 3 numbers.
3. To solve a quadratic equations.
4. To find the simple and compound interest.
5. That reads an integer N and determine whether N is prime or not.
6. To arrange the number in ascending and descending order.
7. To generate the Fibonacci sequence.
8. To Find mean and standard deviation.
9. To find addition and subtraction of two matrices.
10. To find the multiplication of two matrices.

### **Note**

1. This paper should be handled and valued by the faculty of Mathematics only.
2. Both internal and external examiners for University Practical examination should be appointed from the faculty of Mathematics only.



Program: B.Sc. Mathematics				
Core – XII		Course Code:21UMA6C12		Course Title: Linear Algebra
Semester VI	Hours/Week 6	Total Hours 90	Credits 5	Total Marks 100

### Course Objectives

1. Gain knowledge about fundamental concept of the third algebraic system called vector space which has its origin in geometry and physics and establishes some of the properties of such systems.
2. Analyze the concept of a homomorphism between vector spaces.
3. Bring out the formation of matrices from the concept of linear maps.
4. Know the fundamental concepts of linear transformation on vector space and another concept known as the determinant and rank of a matrix.
5. Determine the existence and nature of solution of system of linear equations.

#### **UNIT – I: Vector Spaces**

Vector Spaces – Definition – Simple properties – Examples – Homomorphism – Sub space – Quotient spaces – Internal direct sum – External direct sum. (Chapter 4: Section 4.1, pages: 170-177).

#### **UNIT – II: Vector Spaces (Continuation)**

Linear Independence – Dimension of a Vector space – Bases - Dimension of Quotient spaces. (Chapter 4: Section 4.2, pages: 177-184).

#### **UNIT – III: Linear Transformations.**

Inner product spaces – Definition – Examples – Applications – Orthogonal complement of a sub space – Orthonormal & Orthonormal Basis - Gram Schmidt Orthogonalization process. (Chapter 4: Section 4.4, pages: 191-200).

**UNIT – IV: Linear Transformations (Continuation)**

Linear Transformation – The Algebra of linear transformations - Characteristic roots – Matrices – Canonical forms – Triangular forms. (Chapter 6: Sections 6.1 - 6.4, pages: 260-292).

**UNIT – V: Linear Transformations (Continuation)**

Trace and Transpose – Definitions, Properties – Theorems – Determinants – Definitions – Properties – Theorems – Cramer’s Rule – Problems. (Chapter 6: Sections 6.8-6.9, pages: 313-336)

**Text Book**

I.N. Herstein, Topics in Algebra, John Wiley, New York, 1975.

**Reference Books**

1. Dr.U.S. Rana, Mathematics for Degree Students (B.Sc. 3<sup>rd</sup>Years), S. Chand, 2012.
2. A.R. Vasistha, A first course in Modern Algebra, Krishna PrekasanMandhir, 9-Shivaji Road, Meerut (UP), 1983.
3. M.L. Santiago, Modern Algebra, Tata McGraw Hill, New Delhi, 1994.
4. K. ViswanathaNaik, Modern Algebra, Emerald Publishers, 135, Anna Salai, Chennai, 1988.

**E-Learning Sources**

1. <http://linear.ups.edu/html/section-S.html>
2. <http://www.math.northwestern.edu/~scanez/courses/334/notes/dual-spaces.pdf>
3. [https://mathinsight.org/matrices\\_linear\\_transformations](https://mathinsight.org/matrices_linear_transformations)

**Note:** Questions to be taken only from the text book



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Define and illustrate Vector Spaces, Subspaces, Homomorphism.	K1
CO2	Define Linear independence, Basis and dimension of Quotient Spaces.	K1&K2
CO3	Define Inner Product Space and Orthogonality.	K2& K3
CO4	Describe Theory of Matrices.	K4&K5
CO5	Find the Characteristic equation, Eigen values and vectors. Prove Cayley Hamilton theorem.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core – XIII		Course Code:21UMA6C13		Course Title: Complex Analysis – II
Semester VI	Hours/Week 6	Total Hours 90	Credits 4	Total Marks 100

### Course Objectives

1. Compute Taylor and Laurent series expansions of functions and apply the Residue theorem in the evaluation of integrals.
2. Acquire knowledge in series, functions, Residues and integrals.
3. Understand the theorems on convergence of series, methods of finding residues at singular points of a function etc.
4. Analyse the different methods of evaluation of integrals.

#### **UNIT I : Complex Integration**

Simple rectifiable oriented curves – Integration of complex functions- simple integrals using definition–Definite integral–Interior and exterior of a closed curve–Simply connected region–Cauchy’s Fundamental theorem– Cauchy’s theorem and proof by Goursat–Extension to Cauchy’s fundamental theorem–Cauchy’s integral formula–Cauchy’s integral formula for first derivative–Morera’s theorem. ( Chapter 8: Section: 8.1 to 8.9, Page No: 133-142,144-148,150-153,155-157).

#### **UNIT II : Complex Integration (Continuation)**

Cauchy’s Inequality – Liouville’s theorem – Fundamental theorem of algebra –Maximum modulus theorem-Examples. (Chapter 8: Section: 8.11 , 8.13, Page No:158-161,166-178).

#### **UNIT III: Taylor’s and Laurent’s series**

Taylor’s series –Laurent’s series. Singular point – Isolated singularities– Removable Singularity, pole and essential singularity–Determination of the nature of singularity-Examples. (Chapter 9 : Section: 9.1,9.3,9.5 to 9.9 , 9.11,9.13, Page No:179-181,184-193,197-202).

**UNIT IV: Residues**

Residues –Calculation of residues – Real definite integrals–Jordan’s lemma(Statement only)– Examples.( Chapter 10 : Section: 10.1 to 10.4 Page No:217-248).

**UNIT V:Meromorphic functions**

Meromorphic functions–Principle of argument– Rouché’s theorem –Examples– Hurwitz’s Theorem – Functions Meromorphic in the extended plane. (Chapter 11: Sections 11.1,11.2,11.3 Page No:249-262).

**Text Book**

P. Duraipandian and LaxmiDuraipandian, Complex analysis, Emerald Publishers.

**References**

1. Churchill and Others, Complex Variable and Applications, Tata Mecgrow Hill Publishing Company Ltd., 1974.
2. Santhinarayan , Theory of functions of Complex Variable, S.Chand and Company,Meerut, 1995.
3. Tyagi B.S. Functions of Complex Variable, 17<sup>th</sup>Edition, PragatiPrakasham, Publishing Company Ltd., Meerut, 1992-93.

**E-Learning Sources**

1. <https://people.math.gatech.edu/~cain/winter99/supplement.pdf>
2. [https://wiki.math.ntnu.no/\\_media/tma4175/2016v/solutions\\_5\\_ca.pdf](https://wiki.math.ntnu.no/_media/tma4175/2016v/solutions_5_ca.pdf)
3. <http://wwwf.imperial.ac.uk/~jdg/ee2macom.pdf>

**Note:** Questions to be taken only from the Text Book.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand Integration of complex functions and Cauchy's Fundamental theorem.	K1
CO2	Describe Standard Theorems.	K1&K2
CO3	Discuss Series and singularity.	K2& K3
CO4	Define Residues and Solving Problems.	K4&K5
CO5	Describe Functions Mermorphic in the extended plane.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Core - XIV		Course Code:21UMA6C14		Course Title: Mathematical Statistics – II
Semester VI	Hours/Week 6	Total Hours 90	Credits 4	Total Marks 100

### Course Objectives

1. To apply statistical techniques for interpreting and drawing conclusion for business problem.
2. Compute types of sampling parameter and statistics, Tests of significance and Null Hypothesis.
3. Understand Chi-Square variate and independence of attributes.
4. Understand Student's t-test of Difference of means.
5. Define F-Statistic definition and F-test for equality of population Variance.

#### **UNIT I: Chi Square Distribution**

Introduction–Derivation of  $\chi^2$  Distribution – Moment Generating Function of  $\chi^2$ -t Distribution–F distribution. (Chapter 15 Sections 15.1 to 15.3 Chapter 16 Sections 16.1, 16.2(16.2.1, 16.2.2, 16.2.3), 16.5(16.5.1, 16.5.2, 16.5.3)).

#### **UNIT II: Theory of Estimation**

Introduction – Characteristics of Estimators – Unbiasedness – Consistency – Efficient Estimators – Sufficiency – Cramer-Rao inequality – MVU and Blackwellisation Theorem. (Chapter 17 Sections 17.1, 17.2, 17.3, 17.5).

#### **UNIT III: Large Samples**

Introduction–Types of Sampling- Parameter and statistic– Test of Significance– Procedure for Testing of Hypothesis– Test of Significance –Sampling of Attributes. (Chapter 14 Sections 14.1 to 14.7).

**UNIT IV:** Applications of  $\chi^2$  –distribution– Applications of t-distribution – Applications of Fdistribution – Relation between t and F distributions – Relation between F and  $\chi^2$ distributions.





(Chapter 15 Sections 15.6 (15.6.1, 15.6.2) Chapter 16 Sections 16.3 (16.3.1, 16.3.2, 16.3.3), 16.6, 16.7, 16.8).

**UNIT V:** Analysis of Variance – One - Way Classification – ANOVA table – Two – Way Classification. Design of Experiments: Introduction – Experimental Units – Basic Principles in the Design of Experiments– Complete Block Designs – Completely Randomized Design – Randomized Block Design – Latin Square Design – Analysis of Latin Square Design –Merits and Demerits of Completely Randomized Design – Merits and Demerits of Random Block Design and Latin Square Design. (Chapter 26 Pages 26.14 to 26.27 Chapter 28 Pages 28.1 to 28.17).

### Text Books

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi- 2, 2011.(For Units I, II, III, IV).
2. P.R.Vittal, Mathematical Statistics, Margham Publications, Chennai 2004. (For unit V).

### Reference Books

1. B.L.Agarwal, Basic Statistics, New Age International Publishers, Chennai, 2009.
2. S.P.Gupta, Statistical Methods, Sultan Chand and Sons, New Delhi- 2, 2011.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand Chi-Square variate and independence of attributes.	K1
CO2	Derived Theory of Estimation.	K2
CO3	Describe Sampling and Applications of Sampling.	K3& K4
CO4	Applications of $\chi^2$ –distribution, F distribution.	K5
CO5	Describe Analysis of Variance and Anova Table.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Major Elective		Course Code:21UMA6CE05		Course Title: Astronomy
Semester	Hours/Week	Total Hours	Credits	Total Marks
VI	5	75	4	100

### Course Objectives

1. Acquire the knowledge about the celestial sphere, solar system and stellar universe.
2. Know about lunar eclipse and solar eclipse.
3. Know about the positions of the stars and the constellations as seen from a given place, at a given time, on a given day.

#### **UNIT – I**

Standard formulae in spherical Trigonometry – Statements only – celestial sphere – celestial co-ordinates and their conversions – Diurnal Motion – Problems Connected with Diurnal Motion – Zones of Earth – DIP – Twilight – Problems.

#### **UNIT – II**

Astronomical refraction – Tangent and Cassini's formulae – Geocentric Parallax Heliocentric Parallax – Problems.

#### **UNIT – III**

Kepler's laws of planetary motion – Newton's deductions from Kepler's Laws – Equation of Time – Seasons – Calendar conversion of time – problems.

#### **UNIT – IV**

Fixing the Ecliptic – Fixing the position of the first point of Aries (Flamsteed's Method) – The moon – Different phases – Metonic cycle – Tides – Problems.

#### **UNIT – V**

Eclipses – Solar eclipses – Lunar eclipses – General description of Solar system and stellar universe – Problems.

**TextBook**

Kumaravelu and SusilaKumaravelu, 1984, Astronomy, K.Kumaravelu, MurugaBhavanam, ChidambaraNagar,Nagarkoil–2.

**Reference Book**

1. V.Thiruvenkatacharya,A TextBookofAstronomy,S.ChandandCo.Pvt.Ltd.,.

**E-Learning Sources**

1. www.kidsastronomy.com
2. www.astronomynow.com

**Note:** Questions to be taken only from the text books

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Discuss Standard formulae in spherical Trigonometry.	K1
CO2	Derive astronomicalrefraction, TangentandCassini'sformulaeand GeocentricParallaxHeliocentricParallax.	K2
CO3	Describe Kepler's laws of planetary motion.	K3& K4
CO4	Derive FixingtheEcliptic andFlamsteed'sMethod.	K5
CO5	Describe Eclipses, Solar eclipses and Lunar eclipses.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

S – Strong

M – Medium

L – Low



Program: B.Sc. Mathematics				
Major Elective		Course Code:21UMA6CE06		Course Title: Financial Mathematics
Semester VI	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### Course Objectives

Define an equation of value, Describe how a loan may be repaid by regular installments of interest and capital

**UNIT I:** Deferred and increasing annuities: Introduction – Deferred annuities – Annual payments (arrear and Advance) – Increasing annuities– Annual payments (arrear and Advance) – Decreasing payments.

**UNIT II:** Equations of value:The equation of value and the yield on a transaction– The theory –Solving for an unknown quantity –Solving for the amount of a payment (I or R)– Solving for the timing of a payment (n)– Solving for the interest rate .

**UNIT III:** Loan schedules–Introduction–An example– Calculating the capital outstanding – Introduction–The theory – Prospective loan calculation –Retrospective loan calculation.

**UNIT IV:** Calculating the interest and capital elements of the Loan schedule: Single payment – series of payments –Forming the loan schedule –Consumer credit: flat rates and Annual Percentage Rate.

**UNIT V:** Project appraisal: MWRR , TWRR, LIRR

### **Text Book**

Acted Study Material: Subject - CT1.

### **References**

1. Actuarial mathematics. Bowers, Newton L et al. – 2nd ed. – Society of Actuaries, 1997.xxvi, 753 pages. ISBN: 0 938959 46 8.
2. An introduction to the mathematics of finance. McCutcheon, John J; Scott, William F. London: Heinemann, 1986. 463 pages. ISBN: 0 434 91228 x.



3. Mathematics of compound interest. Butcher, M V; Nesbitt, Cecil J. Ulrich's Books, 1971.324 pages.
4. Theory of financial decision making. Ingersoll, Jonathan E. Rowman & Littlefield, 1987. 474.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Describe Deferred and increasing annuities.	K1
CO2	Discuss Equations of value.	K2
CO3	Describe Loan schedules.	K3 & K4
CO4	Calculating the interest and capital elements.	K5
CO5	Discuss Project appraisal.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
<b>Major Elective-III</b>		<b>Course Code:</b> 21UMA6CE07		<b>Course Title:</b> Analytical Geometry of 2-D and 3-D
<b>Semester</b> VI	<b>Hours/Week</b> 6	<b>Total Hours</b> 90	<b>Credits</b> 4	<b>Total Marks</b> 100

### Course Objectives

1. To learn the properties of parabola, ellipse and hyperbola.
2. To understand the basic concepts of 3D analytical geometry.
3. To learn the techniques of polar coordinates
4. Acquire practical knowledge about plane, straight line, spheres, cone, cylinder and conicoids in three dimensionals.
5. Develop the skill of solving problems related to plane, straight line, spheres, cone, cylinder and conicoids in three dimensionals.

#### **Unit–I Analytical Geometry of 2-D**

Coordinates: Rectangular coordinates– Distance between two points–The coordinates of the point dividing the line joining to given points in a ratio– Area of triangle of whose vertices are known-Simple problems.[ Chapter 1(sections 1-4) ( pages 5-11) ].

#### **Unit–II Analytical Geometry of 3-D**

Straight line – Equation determined by intersection of two planes – Symmetrical form of the equation of the line – Equation of a line passing through two points the plane and straight line – Angle between the plane – Simple problems. [chapter 3( sections1-6) ( pages 46-52 and 56-58)].

#### **Unit–III Sphere**

Definition – Equation of a sphere-length of the Equation of tangent– The plane section of a Sphere is a circle – Equation of a circle on a sphere – Intersection of spheres is a circle – Simple Problems.[ chapter 4 (section 1-7 ) ( pages 92-97 and 100-105)].

**Unit–IV Cone**

Equation of a cone – Cone whose vertex is at the origin – Quadric cone whose vertex is at the origin – General Quadric cone –Simple Problems.[chapter 6 ( section 6.1-6.5 ) ( pages 142-149).

**Unit–V Cylinder**

Equation of a cylinder – Bookwork –Right circular cylinder – Simple Problems. [chapter 6 (section 6.6-6.8). (pages 150-153)].

**Text Books**

1. T.K.Manivasagam Pillai and T.Natarajan, A text Book of Analytical Geometry, part I 2-D, Visvanathan Publications, 2006. (For Unit I).
2. T.K.Manivasagam Pillai and T.Natarajan, A Text Book of Analytical Geometry 3D, Visvanathan Publications, 2010.(For Unit II and III).
3. P.Duraipandian and Lakshmi Duraipandian, D.Muhilan, Analytical Geometry 3D, Emerald Publishers 2004. (For unit IV and V).

**Reference Books**

1. S.G.Venkatachalapathi, Analytical Geometry 2D and 3D, Margham Publications, Chennai – Reprint 2010.
2. P.R.Vittal, Vector Analysis, Analytical Solid Geometry and Sequence and Series, Margham Publications, Second Edition, Chennai, 1999.
3. P.Duraipandian and Lakshmi Duraipandian, D.Muhilan, Analytical Geometry 2D, Emerald Publishers, Reprint 1988.





### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Describe Coordinates, Area of triangle.	K1
CO2	Discuss Straight line, Equation determined by intersection of two planes, Symmetrical form of the equation of the line.	K2
CO3	Discuss Equation of a sphere-length of the Equation of tangent, the plane section of a Sphere is a circle.	K3& K4
CO4	Describe Equation of a cone, Cone whose vertex is at the origin.	K5
CO5	Discuss Equation of a cylinder, Bookwork, and Right circular cylinder.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

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

S – Strong

M – Medium

L – Low



Program: B.Sc. Mathematics				
Skilled Based Elective Course-III		Course Code: 21UMA6S03		Course Title: Quantitative Aptitude
Semester VI	Hours/Week 4	Total Hours 60	Credits 3	Total Marks 100

### Course Objectives

1. To learn the problems solving techniques for aptitude problems.
2. To enable to students prepare themselves for various competitive Examinations.

#### **UNIT – I**

H.C.F & L.C.M of numbers – Average (Section 2,6 Pages 51-68,206-239).

#### **UNIT – II**

Problems on numbers - Problems on Ages (Section 7,8 Pages 240-263,264-277).

#### **UNIT – III**

Percentage - Profit & Loss (Section 11,12 Pages 308-373,374-425).

#### **UNIT – IV**

Time & Work - Time & Distance (Section 17,18 Pages 526-561,562-599).

#### **UNIT – V**

Area - Volume & Surface area (Section 24,25 Pages 688-765,766-813).

#### **Text Book**

Dr.R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Co. Ltd., 7361, Ram Nagar, New Delhi, 2017.

#### **Reference Books**

1. AbhijitGuha, Quantitative Aptitude,Tata McGraw Hill Publishing Company Limited, New Delhi, 2005.
2. Dinesh Khattar, Quantitative Aptitude, Pearson Publication, India, 2005.



3. Prof. K.C.Sinha and Anurag Chandra, Quantitative Aptitude for Competitive Examinations  
Eduwiser's Publishing Group, New Delhi, 2019.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	To solve H.C.F & L.C.M of numbers and averages.	K1
CO2	Solve the problems based on Numbers and ages.	K2
CO3	Solve the problems based on Percentage - Profit & Loss.	K3 & K4
CO4	Solve the problems based on Time & Work - Time & Distance.	K5
CO5	Solve the problems based on Area - Volume & Surface area.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



**Program: B.Sc. Mathematics**

<b>Skilled Based Elective Course-IV</b>		<b>Course Code: 21UMA6SP02</b>		<b>Course Title: R Programming (Statistics) Practical</b>	
<b>Semester VI</b>	<b>Hours/Week 2</b>	<b>Total Hours 30</b>	<b>Credits 2</b>	<b>Total Marks 100</b>	

**Course Objectives**

1. To learn the problems solving techniques for measures of central tendency.
2. To enable to students prepare themselves for binomial, normal and poisson distributions.

**LIST OF EXPERIMENTS**

1. Calculation of measures of central tendency
2. Calculation of measures of dispersion
3. Graphical display of data
4. Analyzing data using tables
5. Expectations of discrete and continuous random variable
6. Binomial, Normal and Poisson Distributions
7. One sample t-test
8. Independent sample t-test
9. Dependent sample t-test
10. One-way Between-Groups ANOVA
11. Unplanned and planned comparisons
12. Two-way Between-Groups ANOVA
13. Chi-square test of independence
14. Bi-variate correlation
15. Partial correlation
16. Rank Correlation
17. Linear regression

**Reference Books**

1. Mark Gardener, Beginning R – The Statistical Programming Language, Wiley Publications, 2015.
2. W. John Braun and Duncan J. Murdoch, A First Course in Statistical Programming with R, Cambridge University Press, 2007.



**Program: B.Sc. Mathematics**

Allied Mathematics B.Sc.PHY/CHE/CS/BCA		<b>Course Code: 21UMA1A01</b>	<b>Course Title: Allied Mathematics – I</b>		
<b>Semester</b> I	<b>Hours/Week</b> 6	<b>Total Hours</b> 75	<b>Credits</b> 5	<b>Total Marks</b> 100	

**Course Objectives**

1. To acquire knowledge about the rank of a matrix, characteristic roots and characteristic vectors.
2. To gain knowledge about the various concepts on matrices.
3. Promote problem solving ability in differential equations.

**UNIT I: MATRICES**

Definition of characteristics Equation of a matrix – characteristics roots of a matrix – Eigen values and the corresponding Eigen vectors of matrix – Cayley Hamilton theorem (statement only) – Verification of Cayley Hamilton theorem – problems. (Chapter 5 , Pages: 5.50-5.73).

**UNIT II: FINITE DIFFERENCES**

Finite differences – Newton’s forward and backward formula for interpolation – Lagrange’s formula – Interpolation of missing values. (Chapter 7, Pages: 7.1-7.29).

**UNIT III: RADIUS OF CURVATURE**

Formula of radius of curvature in Cartesian coordinates-parametric coordinates and polar coordinates (no proof for formulae) – problems only. (Chapter 11 Pages: 11.1-11.19 & 11.22-11.33).

**UNIT IV: ORDINARY DIFFERENTIAL EQUATIONS**

Ordinary Differential Equation – second order differential equation with constant co-efficient – Particular integrals of the form  $e^{ax}v$ , where  $v$  is of the form  $x, x^2, \sin ax, \cos ax$ . (Chapter 23, Pages: 23.1-23.28).



## UNIT V: PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions – Lagrange’s linear partial differential equations  $Pp+Qq=R$  -problems only. (Chapter 26, Pages;26.1-26.14 & 26.44-26.56).

### Text Book

Dr. P.R. Vittal, Allied Mathematics, Margham Publications, Chennai-17, Reprint 2012.

### Reference Books

1. S.G. Venkatachalapathi, Allied Mathematics, Margham Publications, Chennai-17, Reprint 2011.
2. P.R.Vittal, V. Maline, Calculus, Margham Publications, Chennai-17, Reprint 2012.
3. P. Duraipandian, Dr. S. Udayabaskaran, Allied Maths, Volume –1, Muhil Publishers Chennai- 28, Reprint 1999.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge about the rank of a matrix, characteristic roots and characteristic vectors.	K1
CO2	Solve algebraic and transcendental equations by Numerical methods.	K2
CO3	Solve the problem of radius of curvature in Cartesian coordinates, parametric coordinates and polar coordinates	K3 & K4
CO4	recall the concepts of second order differential equations and acquire knowledge to find the particular integral for different types of functions.	K4 & K5
CO5	Analyse the different types of solutions for partial differential equations.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Sc. Mathematics				
Allied Mathematics B.Sc.PHY/CHE/CS/BCA		Course Code: 21UMA2A02		Course Title: Allied Mathematics – II
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	6	75	5	100

### Course Objectives

1. To acquire knowledge about the Integral calculus and Laplace transform.
2. Understand the method of doing problems using the above concepts.
3. Acquire knowledge in theory of equations
4. Acquire the knowledge in vector differentiation.

### **UNIT I: DEFINITE INTEGRAL**

Definite integrals Simple properties of definite integrals – Bernoulli’s formula – Integration by

parts-Simple problems-Reduction formula for  $\int_0^{\frac{\pi}{2}} \sin^n x dx$  ,  $\int_0^{\frac{\pi}{2}} \cos^n x dx$  ,  $\int_0^{\infty} e^{-x} x^n dx$  -simple

problems. (Chapter 15& 16 , Pages 15.54-15.75& 16.1-16.9).

### **UNIT II: THEORY OF EQUATION**

Imaginary and irrational roots – Reciprocal equation – diminish the root of equations – Removal of terms – Descartes’ rule of signs. (Chapter 6, pages: 6.19-6.25, 6.30-6.37,6.49-6.60).

### **UNIT III: LAPLACE AND INVERSE LAPLACE TRANSFORMS**

Laplace Transforms – Definition-laplace transform of standard functions – Elementary theorems – problems – Inverse Laplace Transforms – Standard formula – problems. (Chapter 27, Pages: 27.1-27.19, 27.23-27.38).



**UNIT IV: VECTOR DIFFERENTIATION**

Vector Differentiation – Limit of a vector function – Continuity and derivative of vector function – Gradient – Directional Derivative of Scalar Point Functions – Equation of Tangent Plane and Normal Line to a level surface – Problems only. (Chapter 28, Pages: 1-20).

**UNIT V: VECTOR DIFFERENTIATION (Continuation)**

Vector Point Function: Divergence and Curl of a vector point function – Solenoidal and irrotational functions – vector identities – Laplacian operator. (Chapter 28, Page no. 22-33, 35-50).

**Text Book**

Dr. P.R. Vittal, Allied Mathematics, Margham Publications, Chennai-17, Reprint 2012.

**Reference Books**

1. S.G. Venkatachalapathi, Allied Mathematics, Margham Publications, Chennai-17, Reprint 2011.
2. Vector Analysis, Dr. P.R. Vittal, Margham Publications, Chennai-17, Reprint 2006.
3. Vector Analysis, P. Duraipandian and Laxmi Duraipandian, Emerald Publishers, Reprint 2003.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Grasp the concept of multiple integrals and its evaluations.	K1
CO2	Understand the relation between the roots and coefficients, symmetric functions of the roots, reciprocal equation and solve the related problems.	K2
CO3	Learn the Laplace and Inverse Laplace transform of elementary functions and study its applications.	K3 & K4
CO4	To solve Vector Differentiation, Limit of a vector function, Continuity and derivative of vector function.	K5
CO5	Analyse the different types of Vector Point Function.	K5 & K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



B.Sc. Mathematics Allied Program for Chemistry only					
Allied Practical B.Sc Chemistry		Course code 21UMA2AP01	Course title: LATEX PRACTICAL		
Semester II	Hours/Week 2	Total Hours 30	Credits 3	Total Marks 100	

### LATEX PRACTICAL

#### LIST OF PRACTICALS

**Write Latex program for the following**

1. Type a Document in different alignments (Left, Right, Center, Justify).
2. Type a Letter for applying a job.
3. Type your own Bio – Data.
4. Draw a Table structure.
5. Type a given Mathematical expression using Differentiation, Integration and Trigonometry.
6. Type a given Mathematical expression using all expression.
7. Type a given expression using all inequalities.
8. Type of given Article.
9. Draw any picture and insert in LaTeX file.
10. Type a given Question paper
11. Convert one LaTeX file into power point presentation.

#### TEXT BOOK:

David F Griffiths and Desmond J. Higham, Learning LaTeX, SIAM (Society for Industrial and Applied Mathematics) Publishers, Phidel Phia, 1996.

**REFERENCE BOOKS**

1. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.
2. L. Lamport. LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley, New York, second edition, 1994

**Note: This paper should be handled and valued by the faculty of Mathematics only.**

- Both Internal and External Examiners for University Practical Examination should be appointed from faculty of Mathematics only.



BBA				
	<b>Course</b> <b>Code:21UMB1A01</b>	<b>Course Title:</b> <b>Business Mathematics and Statistics – I</b>		
<b>Semester</b>	<b>Hours/Week</b>	<b>Total Hours</b>	<b>Credits</b>	<b>Total Marks</b>
I	5	75	4	100

### Course Objectives

1. To enable the students to acquire knowledge of business correspondence.
2. To enable the student to solve business and finances problems.
3. To help examines aspects of business and marketing with regards to basic statistical analysis

#### **UNIT – I**

Set theory : Methods of Description of sets- Types of sets- Venn diagram-Set operations – Laws and property of sets-(Simple Problems Only).

(Part -I page 104-126)

#### **UNIT – II**

Matrices: Fundamental ideas about Matrices and their Operational Rules – Matrix Addition and Multiplication – Inverse of Square Matrices of not More than Order Third – Solving Simultaneous Equations. (Part -I , page 147 -186)

#### **UNIT – III**

Description Statistics: Meaning and Definition of Statistics – Scope and Limitations Statistical Survey – Source and Collection of Data – Classification and Tabulation – Presentation of Statistical Report.( Part -II ,Page 1-40, 60-64, 83-88)

#### **UNIT – IV**

Measures of Central Tendency : Arithmetic, Geometric, Harmonic Mean – Mean – Median – Mode – Combined Mean.

(Part -II, page 159-180,196-209,212-227,230-237)

**UNIT – V**

Measures of Variations : Absolute and Relative Measures – Range – Quartile Deviation – Mean Deviation – Standard Deviation.

(Part -II, page 301-339)

**Text Book:**

Naveneetham P, Business Mathemaitcs, Jai Publications, 2008.

**Reference Books**

1. P.R. Vittal, Business Mathematics and Statistics, Margham Publications, 2016.
2. S.P. Gupta, Statistical Methods – Sulthan Chand & Sons, 7th Edition, New Delhi, 2014.
3. R.S.N. Pillai & Mrs. Bagavathi, Statistics, Sulthan Chand & Sons, New Delhi, 2019.
4. Sharma, Business Statistics, Margham Publications, 5th Edition, Chennai, 2020



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Learn about Arithmetic Progression, Geometric Progression and Harmonic Progression.	K1 & K2
CO2	Apply Fundamental ideas about matrices and their operational rules.	K3
CO3	Understand source, collection of data and apply for practical life.	K3
CO4	Plot and interpret straight line graphs, apply them to business decision-making and discuss the significant features of nonlinear graphs.	K4 & K5
CO5	Demonstrate correct usage of measures of central tendency and measures of dispersion to describe data and perform analysis of data based on the results of these measures.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyses, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

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

S – Strong

M – Medium

L – Low



BBA				
	<b>Course Code:</b> 21UMB2A02	<b>Course Title:</b> Business Mathematics and Statistics – II		
<b>Semester</b> II	<b>Hours/Week</b> 5	<b>Total Hours</b> 75	<b>Credits</b> 4	<b>Total Marks</b> 100

### Course Objectives

1. To enable the students of management to understand the application of mathematics in business.
2. To develop the students ability to deal with numerical and quantitative issues in business

### **UNIT – I**

Mathematics of Finance: Simple Interest formula and problems - Compound Interest formula and problems – Effective rate and Nominal rate of Interest – Depreciation (Part -I, page 43 - 65)

### **UNIT – II**

Basics of Calculus : Rules of Differentiation – Maxima and Minima (Single Variable Case Only) – Simple Application Problems in Maxima and Minima. (Part –I,page 247 -275,288-293)

### **UNIT – III**

Index Numbers : Definition – Construction of Index Numbers – Weighted and Unweighted Index Number – Fixed and Chain Index Numbers – Test for an Ideal Index Numbers – Cost of Living Index Number (Part -II , page 444 -471,474-484)

### **UNIT – IV**

Linear Simple Correlation : Scatter Diagram – Karl pearson’s Coefficient of Correlation – Rank Correlation Coefficient – Regression Lines – Fitting of Regression Line. (Part -II, page 503 - 554)



**UNIT – V**

Time Series Analysis: Components of Time Series – Measures of Trend – Free Hand Curve – Semi and Moving Average – Methods of Least Squares – Measures of Seasonal Variation – Simple Average Method. (Part -II, page 579 -603)

**Text Book:**

Navaneetham P, Business Mathemaitcs, Jai Publications, 2008.

**Reference Books**

1. Dharmapadam, Business Mathematics, S. Viswanathan Publications, 2010.
2. S.P. Gupta, Statistical Methods, Sultan Chand & Co, 7<sup>th</sup> Edition, 2014.
3. R.S.N. Pillai & V. Bagavathi, Statistics, Sultan Chand & Co, 2016.
4. Dr. P.R. Vittal, Business Mathematics and Statistics, Margham Publications, 2016.

**Course Outcomes (Cos)**

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

CO Number	CO Statement	Knowledge Level
CO1	Learn basic of mathematics finance	K1 & K2
CO2	Understand calculus , rules of differentiation, maxima & minima	K2
CO3	Describe index number & ideal index number Learn linear simple correlation and regression line	K3 & K4
CO4	Learn linear simple correlation and regression line	K5
CO5	Describe index number & ideal index number	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create



**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



BBA				
	<b>Course Code:21UMB5A03</b>	<b>Course Title: Operations research</b>		
<b>Semester</b>	<b>Hours/Week</b>	<b>Total Hours</b>	<b>Credits</b>	<b>Total Marks</b>
V	5	75	4	100

### Course Objectives

1. To enable the students to solving the operational questions, solving questions related resources
2. To help the student develop to take better and quicker decisions.

### UNIT - I

Operations research : Introduction – Definition – Models and Modelling in operations research – Methodology of operation research – Opportunities and Shot coming – Applications and scope– Uses– limitations of Operation research. ( Chapter-I , Page 1.1 – 1.33)

### UNIT - II

Linear programming problems: Introduction – requirements – Formulation of L.P.P. by graphical method – simplex method (simple problem only).

(Chapter– II, page – 2.1 – 2.43& Chapter – III, Page 3.1 – 3.19)

### UNIT – III

Transportation problems – Formulation of Transportation problems – obtaining initial basic feasible solution – NWCM, LCM, Vogel’s methods. Assignment problems – formulation and solution assignment problems.

(Chapter– VI, page – 5.1 – 5.16 & Chapter – VI, Page 6.3 – 6.26)

### UNIT-IV

Decision theory : Types of decision making criteria statement of Bay's theorem – application of Bay's theorem – use of probability – decision tree.

(Chapter– X, page – 10.3 – 10.31)

**UNIT-V**

Game Theory- Basic Terminologies- Two person Zero sum game – Game with saddle point (minimax and maximum) (Chapter– XI, page – 11.3 – 11.39)

**TEXTBOOK**

Kapoor V.K. Operations Research, Sultan Chand & Sons, New Delhi.

**REFERENCE BOOKS**

- 1 Prem Kumar Gupta, Operations Research – Sultan Chand & Co.
2. P.K.Man Mohan, Operations Research – Sultan Chand & Sons. .
3. Vital P.R. Introduction to Operations Research, Margham Publications, Chennai.

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Learn basic concept of operation research	K1
CO2	Understand rules of Linear programming problem	K2
CO3	Learn Transportation problems and assignment problem	K3 & K4
CO4	Develop better equipped to understand and influence the decision making process	K5
CO5	Distinguish a game situation from a pure individual decision	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**



BBA (CA)				
	Course Code:21UMX1A01	Course Title: Business Mathematics and Statistics		
Semester I	Hours/Week 5	Total Hours 75	Credits 4	Total Marks 100

### Course Objectives

1. To enable the students to acquire knowledge of business correspondence
2. To develop the students ability to deal with numerical and quantitative issues in business
3. To help examines aspects of business and marketing with regards to basic statistical analysis

### UNIT -I

Matrix Algebra -Definition -Types of Matrices -Matrix operations Determinants Inverse of a matrix- Simultaneous linear Equations (3x3order only).

(Chapter – I, page 1.1 – 1.50)

### UNIT-II

Mathematics of Finance: Simple Interest formula and problems - Compound Interest formula and problems – Effective rate and Nominal rate of Interest.

(Chapter – VIII, IX, page 146 – 173)

### UNIT -III

Statistics Introduction :Definition-Meaning-Scope -Limitations. Collection of data Classification and Tabulation - Measures of Central Tendency -Mean -Median - Mode - Geometric Mean -Harmonic Mean. (Part II Chapter – I, II, III, V , page 1- 26 & 50- 84)

### UNIT -IV

Measures of Dispersion-Range-Quartile Deviation-Mean Deviation- Standard Deviation-Coefficient of Variation- Time series- Components of time series. (Part II Chapter – VI , page 85- 124)

**UNIT –V**

Correlation -Meaning -Various types of correlation - Scatter Diagram -Karl Pearson Co-efficient of correlation -Rank Correlation. Regression -Regression lines - Regression Co-efficient. (Part II Chapter – VI , page 177- 231)

**TEXT BOOK**

P.R. Vittal, Business Mathematics and Statistics, Margham Publications.

**REFERENCE BOOKS**

1. Dr.S.P.Gupta&Dr.M.P.Gupta, Business Statistics, Sultan & Chand Sons. RSN Pillai &V.Bagavathi, Statistics,S.Chand.
2. Naveneetham P, Business Mathemaitcs, Jai Publications, 2008.
3. Dharmapadam, Business Mathematics, S. Viswanathan Publications, 2010.
4. S.P. Gupta, Statistical Methods, Sultan Chand & Co, 7th Edition, 2014.

**Course Outcomes (COs)**

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

<b>CO Number</b>	<b>CO Statement</b>	<b>Knowledge Level</b>
CO1	Learn about Fundamental ideas about matrices and their operational rules.	K1 & K2
CO2	Understand the Fundamental ideas of finances	K3
CO3	Understand source, collection of data and apply for practical life.	K3 & K4
CO4	Select the appropriate measure of dispersion and correctly calculate and interpret the statistic	K5
CO5	Describe the linear simple correlation and regression line	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Cre**

**Mapping of COs with POs**

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

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





Program: BBA (CA)				
Allied – III		Course Code: 21UMX3A02		Course Title : Operations research
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	5	75	3	100

### Course Objectives

1. To enable the students to solving the operational questions, solving questions related resources
2. To help the student develop to take better and quicker decisions.

### UNIT - I

Operations research : Introduction – Definition – Models and Modelling in operations research – Methodology of operation research – Opportunities and Shot coming – Applications and scope– Uses– limitations of Operation research. ( Chapter–I , Page 1.1 – 1.33)

### UNIT - II

Linear programming problems: Introduction – requirements – Formulation of L.P.P. by graphical method – simplex method (simple problem only). (Chapter– II, page – 2.1 – 2.43& Chapter – III, Page 3.1 – 3.19)

### UNIT – III

Transportation problems – Formulation of Transportation problems – obtaining initial basic feasible solution – NWCM, LCM, Vogel’s methods. Assignment problems – formulation and solution assignment problems. (Chapter– VI, page – 5.1 – 5.16 & Chapter – VI, Page 6.3 – 6.26)

### UNIT-IV

Decision theory : Types of decision making criteria statement of Bay's theorem – application of Bay's theorem – use of probability – decision tree. (Chapter– X, page – 10.3 – 10.31)

### UNIT-V



Network Analysis – construction of network- Time and critical path calculations- CPM and PERT application. (Chapter– XIII, page – 13.3 – 13.32)

### TEXT BOOK

Kapoor V.K. Operations Research, Sultan Chand & Sons, New Delhi.

### REFERENCE BOOKS

- 1 Prem Kumar Gupta, Operations Research – Sultan Chand & Co.
2. P.K.ManMohan, Operations Research – Sultan Chand & Sons. .
3. Vital P.R .Introduction to Operations Research, Margham Publications ,Chennai.

### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Learn basic concept of operation research	K1
CO2	Understand rules of Linear programming problem	K2
CO3	Learn Transportation problems and assignment problem	K3 & K4
CO4	Develop better equipped to understand and influence the decision making process	K5
CO5	Distinguish to formulate and solve the network and graphs	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

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

S – Strong

M – Medium

L – Low



Program: B.Com & B.Com (CA)				
Allied – III		Course Code: 21UMA3A03		Course Title :
				Business Statistical Methods
Semester	Hours/Week	Total Hours	Credits	Total Marks
III	6	90	4	100

### Course Objectives

1. To facilitate students to understand fundamentals of statistics.
2. To promote skill of applying statistical techniques in business.
3. To enable students to apply the statistical tools in analysis and interpretation of data.

### UNIT – I

Introduction – Meaning – Definition – Features – Scope – Collection and Tabulation of Statistical Data – Frequency Distribution – Measure of Central Tendency – Mean, Median, Mode. ( chapter-1; Page no: 1-31, & chapter-7; Page no: 159-235)

### UNIT – II

Measures of Dispersion – Importance of measures of Dispersion – Properties of a measures of Dispersion – Absolute and relative Measures – Range – Quartile Deviation – Standard Deviation. (chapter-8; Page no: 301-310 & 325-340)

### UNIT – III

Correlation – Types of Correlation – Measures of Correlation – Karl Pearson's Co-efficient of Correlation – Spearman Rank Correlation Co-efficient. Simple Regression Analysis – Regression Equation, Fitting of Regression Lines – Relationship Between Regression Co-efficient and Correlation Co-efficient.( Chapter-12; Page no: 503-526 & Chapter-13; Page no: 540-554)

### UNIT – IV

Index Number, Definition of Index Numbers, Uses – Problems in the Construction of Index Numbers, Simple and Weighted Index Numbers. Test of Consistency and adequacy – Unit



Test– Time reversal Test – Factor Reversal Test–Circular Test – Chain and Fixed Base Index – Cost of Living Index Numbers. .( Chapter-10; Page no: 444-482)

### UNIT – V

Analysis of Time Series – Definition – Components of Time Series, Uses, Measures of Secular Trend, Measure of Seasonal Variation. (Method of Simple Average Only.) .( Chapter-14; Page no: 579-610)

### TEXT BOOK:

P.A. Navaneethan, Business Statistics, Jai Publishers, Trichy, 2019.

### REFERENCE BOOKS

1. S.P. Rajagopalan and Sattanathan, Business Statistics, Vijay Nicole Imprints Pvt. Ltd, Chennai, 2019.
2. D.C. Sanchati and V.K. Kapoor, Statistics, Sultan Chand and Sons, New Delhi, 2018.
3. S. C. Gupta, Fundamental of Statistics, Himalaya Publishing House Pvt. Ltd., Mumbai, 2016.
4. S.P. Guptha, Statistical Methods, Sultan Chand and Sons, New Delhi, 2018.



### Course Outcomes (COs)

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

CO Number	CO Statement	Knowledge Level
CO1	Understand basic knowledge about statistics and measures of central tendency.	K1 & K2
CO2	Promote skill for calculation of measures of dispersion	K3
CO3	Enable students to apply the statistical tools of correlation and regression analysis for interpretation of data.	K4
CO4	Gather information about index and construction of index number.	K5
CO5	Update knowledge of analysis of time series	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

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

**S – Strong**

**M – Medium**

**L – Low**



Program: B.Com & B.Com (CA)				
<b>Allied – IV</b>	<b>Course Code:</b> <b>21UMA4A04</b>		<b>Course Title:</b> Business Mathematics and Statistical Techniques	
<b>Semester</b> IV	<b>Hours/Week</b> 6	<b>Total Hours</b> 90	<b>Credits</b> 4	<b>Total Marks</b> 100

### Course Objectives

1. To provide advance statistical techniques for business data analysis.
2. To expose students in practical application of mathematical techniques in business.
3. To enable students to apply techniques of operations research in solving complex business problems.

#### UNIT – I

Matrix: Definitions – Operations on Matrix – Determinant of Matrix. Inverse of a Matrix (Ad–joint method only) – Application: Solving Linear Equations – Matrix Inverse Method; Crammers Method. .( Chapter-21; Page no: 885-924)

#### UNIT – II

Probability: Definition – Addition and Multiplication Theorems – Conditional Probability (Simple Problems Only). .( Chapter-16; Page no: 654-684)

#### UNIT – III

Linear Programming: Formation of LPP, Solution to LPP – Graphical Simplex Method ( Chapter-17; Page no: 700-736)

#### UNIT – IV

Transportation Problem: North West Corner Method – Matrix Minima (or) Least Cost Method Vogel's Approximation Method – Assignment Problem – Balanced Hungarian Assignment Method. .( Chapter-18; Page no: 754-778,& Chapter-19; Page no: 811-823)

**UNIT-V**

Game Theory- Basic Terminologies- Two person Zero sum game – Game with saddle point ( minimax and maximum) (Chapter– 11, page ;11.3 – 11.23)

**TEXT BOOKS:**

1. P.A. Navaneethan, Business Statistics, Jai Publishers, Trichy, 2019.(Unit I-IV)
2. Kapoor V.K. Operations Research, Sultan Chand & Sons, New Delhi.(Unit-V)

**REFERENCE BOOKS**

1. Mr. M. Wilson, Business Mathematics, Himalaya Publishing House Pvt. Ltd., Mumbai, 2019.
2. S. Kalavathy , Operations Research, Second Edition, Vikas Publishing House Pvt.Ltd.
3. S.P. Rajagopalan and Sattanathan, Business Statistics, Vijay Nicole Imprints Pvt. Ltd, Chennai, 2018.
4. Dr. S.K. Sharma, Dr. Gurmeet Kaur, Business Mathematics, Sultan Chand and Sons, New Delhi, 2018.

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge about joint stock companies and amendments.	K1 & K2
CO2	Gain knowledge relating to promotion and incorporation of a joint stock company.	K3
CO3	Get an idea about rising of capital through issue of shares and debentures.	K4
CO4	Learn about the management of companies, appointment of director etc.	K5
CO5	Get an insight into the winding up procedure for a company.	K6

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

S – Strong

M – Medium

L – Low





(Offered to students of all Programmes)		NMEC		
Course Code: 21UMA4N04		Course Title: Quantitative Aptitude		
Semester IV	Hours/Week 2	Total Hours 30	Credits 2	Total Marks 100

### Course Description and Objective:

- To provide the knowledge to analyse, interpret and solve the Mathematical problems.
- To develop the thinking capacity.
- To inquire many short tricks to solve problems.

#### UNIT I (6 Hours)

Surds and Indices

#### UNIT II (6 Hours)

Logarithms

#### UNIT III (6 Hours)

Permutations and Combinations

#### UNIT IV (6 Hours)

Probability

#### UNIT V (6 Hours)

Tabulation

### TEXT BOOK:

**R. S. Aggarwal**, Quantitative Aptitude – For Competitive Examinations (Fully Solved), S.Chand & Company Pvt.Ltd, Reprint 2017.

### REFERENCE BOOKS:

1. **T.K. Sinha**, 80+ Practice Sets of Quantitative Aptitude for Bank PO Exams, Arihant Publication (India) limited, 2002.



2. **S.P. Gupta and P.K.Gupta**, Quantitative Aptitude, Sultan Chand and Sons, New Delhi, 2008.

**Course Outcomes:**

By learning the course, the students will be able

- To perform basic mathematics in numbers.
- To perform quickly solved Aptitude mathematics problems.
- To perform ability skills

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Classify the Problems on Surds and Indices	K2&K3
CO2	Illustrate to Logarithms	K2
CO3	Describe the problems on Permutations and Combinations	K2
CO4	Describe the problems on Probability	K1
CO5	Identify the ideas of the problems on Tabulation	K2

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with POs**

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

**S – Strong**

**M – Medium**

**L – Low**

**Pedagogy:**

Chalk and Talk, PPT, Discussion and Quiz.

Mathematics		Diploma Course		
Course Code:		Course Title: MATLAB		
Semester	Hours/Week	Total Hours 60	Credits	Total Marks

**Course Objectives**

1. To introduce the mathematical software MATLAB for high-performance numerical computation.
2. To learn MATLAB built in functions provided to solve all type of scientific problems.
3. Drawing 2D plots and 3D Plots.
4. Solving Matrix Problems
5. Solving Linear Equations.
5. Solving Differential Equations

**UNIT I: Basic of MATLAB- Matrix Functions**

**Basics**, Windows, variables, File types, Matrices and vectors, Matrix manipulation, Matrix and Array operations, Arithmetic operations, Relational operations, Logical Operations, Elementary math functions, Matrix functions, Manipulating character strings, array operations, vectorization.

**UNIT II: Built in functions**

Inline functions, Anonymous functions, Built in function, Complex Arithmetic, Solving linear systems, Eigen value and vectors, Calculus.

**UNIT III: Graphics**

Basic 2-D plots, specialized 2-D plots, 3-D plots, 3-D surface Graphics.

**UNIT IV: MATLAB Algorithms and Programs**

The solution of Non linear Equations  $f(x)=0$ , Newton-Raphson Method, The solution of linear systems  $AX=B$ , Gaussian Elimination Method.

**UNIT V: MATLAB Algorithms and Programs**

Curve Fitting : Least square line, Numerical Integration: Trapezoidal and Simpson's Rule, Solution of Differential Equations: Euler's Method-Taylor's Method-Runge-Kutta Methods.

**TEXT BOOKS**

1. **Rudra Pratap**, Getting started with MATLAB 7, Oxford University Press, 2008
2. **John H. Mathews and Kurds D. Fink**, Numerical Methods using MATLAB, third edition, Prentice Hall, Upper Saddle River, NJ, 1999

**REFERENCES**

1. **Brain R Hunt, Ronald L Lipsman, Jonathan M Rosenberg**, A guide to MATLAB for Beginners and Experienced Users, Cambridge University Press, 2003
2. **C. Woodford and C. Phillips**, Numerical Methods with Worked Examples, MATLAB Editions, Springer, Netherlands, 2012.

**Course Outcomes (COs)**

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

CO Number	CO Statement	Knowledge Level
CO1	Understand and explain MATLAB Programming.	K1
CO2	Interpret the fundamental MATLAB functions.	K1 & K3
CO3	Understand the concept of Graphics	K3
CO4	Understand the Algorithms and Programs in MATLAB	K5
CO5	Understand the Algorithms and Programs some Mathematical functions in MATLAB	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

**Mapping of COs with POs**

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

S – Strong

M – Medium

L – Low



B.Sc. Mathematics		Bridge Course		
Course Code:		Course Title: Basic Mathematics		
Semester I	Hours/Week	Total Hours 15	Credits -	Total Marks 50

### Basic Mathematics

#### UNIT-I

**Matrix:** Types of Matrices and its properties.

#### UNIT-II

**Differentiation:** Basic formulae – Addition rule – Quotient rule – Functions of functions.

#### UNIT-III

**Integration:** Basic formulae – Integration by parts – Bernoulli's formula.

#### Question Pattern:

Multiple choice Questions ( 50 x 1 = 50 )