

M.Sc Mathematics

SYLLABUS

2022-2024 Batch

SEMESTER I & II

PROGRAMME EDUCATIONAL OBJECTIVES

The M. Sc Mathematics curriculum is dedicated to preparing students for productive careers after 3-5 years of graduation.

- 1. Apply their knowledge in modern industry or teaching, or secure acceptance in highquality graduate programs in mathematics.
- 2. Development in their chosen profession and/or progress toward an advanced degree
- 3. The trust and respect of others as effective and ethical team members.
- 4. Graduates will become effective collaborators and innovators, leading or participating in efforts to address social, technical and business challenges.
- 5. Promote the culture of interdisciplinary research among all disciplines and applied mathematics.

PROGRAMME LEARNING OUTCOME

On the successful completion of the programme, the following are the expected outcomes

- 1. Students acquire sound analytical and practical knowledge to formulate and solve challenging problems.
- 2. Students will be able to read and identify mathematical and computational methods in order to solve comprehensive problems.
- 3. Students are well prepared to take jobs in schools and colleges as Mathematics Teachers and Professors, Software Industries, Research and Development Organizations.
- Students to purse higher studies in Mathematical and Computing Sciences and to clear Competitive exams like SET/ NET/ TET etc.
- 5. Students to learn and apply Mathematics in real life situations aiming at service to the society.

PROGRAMME SPECIFIC OUTCOME

- 1. Provide Strong foundation and inculcate ample knowledge on topics in pure and applied mathematics, empowering the students to pursue higher degrees at reputed academic institutions
- 2. Advanced mathematical topics provide opportunities to research students for communication and discussion.
- 3. Demonstrate the highest standard of ethics in research.
- 4. Provide scope for interaction with international researchers and developing collaborations.
- 5. Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.
- 6. Nurture problem solving skills, thinking, creativity through assignments, project work.
- 7. Generate publications in reputed mathematical journals.

P.S.G.R. KRISHNAMMALCOLLEGE FOR WOMEN College of Excellence, nirf 2022– 6th Rank

(An Autonomous Institution Affiliated to Bharathiar University) (Accredited with 'A++' Grade by NAAC, An ISO 9001:2015 Certified Institution) Peelamedu, Coimbatore – 641004 Programme& Branch: M.Sc MATHEMATICS

SCHEME OF EXAMINATION - (Applicable to students admitted during the academic year 2022-2023)

Subject	Title of the paper	Туре	Hours	Contact	Tutorial	Duration	Examination Marks		Credits	
Code			per Week	Hrs	Hrs	of Exam	CA	ESE	Total	-
SEMESTER	I	•								
MTH2201	Algebra	Core	6	86	4	3 hrs	50	50	100	4
MTH2202	Real Analysis	Core	6	86	4	3 hrs	50	50	100	4
MTH2203	Ordinary Differential	Core	6	86	4	3 hrs	50	50	100	4
	Equations									
MTH2204	Mathematical Statistics	Core	6	86	4	3 hrs	50	50	100	4
MTH22E1	Elective I: Financial	Elective	6	86	4	3 hrs	50	50	100	4
	Mathematics (OR)									
MTH22E2	Elective II: Graph Theory									
SEMESTER	П									
MTH2205	Number Theory	Core	5	71	4	3 hrs	50	50	100	4
MTH2206	Lebesgue Measure Theory	Core	5	71	4	3 hrs	50	50	100	4
MTH2207	Partial Differential Equations	Core	5	71	4	3 hrs	50	50	100	4
MTH2208	Mechanics	Core	6	86	4	3 hrs	50	50	100	5
MTH22E3	Elective III: Control theory	Elective	4	56	4	3 hrs	50	50	100	3
	(OR)									
MTH22E4	Elective IV: Stochastic									
	Processes									
MCM18A3	IDC-Financial and	Inter	5	75	-	3hrs	-	100	100	3
	Management Accounting	disciplinary								

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH2201	ALGEBKA	CORE	86	4	-	4
IVI I 112201						

- To develop the capability among students for handling abstract concepts and to provide the students with experience in axiomatic mathematics while keeping in close touch with the computational aspects of the subject.
- To prepare students to understand principles, concepts necessary to formulate, solve and analyze Algebra
- > To prepare the students for further courses in higher mathematics and related disciplines

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand competence with the basic ideas of algebra including the concepts of direct products, finitely generated abelian groups	K2
CLO2	Apply knowledge of the structures of fields ,extension fields and finite fields	K3
CLO 3	Analyze the significance Sylow's theorem and Galois theory	K4
CLO 4	Evaluate clear and accurate proofs using the concepts of Algebra	K5
CLO 5	Create competence with the basic ideas of linear Algebra including the concepts of modules and linear transformations	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	S	S	S
CLO 2	S	S	S	М	S
CLO 3	S	S	S	S	S
CLO 4	S	S	М	S	S
CLO 5	S	S	S	S	М

Unit I

Unit II

Unit III

Unit IV

Unit V

CORE I - SEMESTER I – ALGEBRA (MTH2201)

inner product spaces – modules

Fields: Extension Fields - Roots of Polynomials - More about root-Elements of Galois Theory -

Solvability by radicals -Finite fields

Linear Transformation: The algebra of linear transformations - Characteristic roots - Matrices - Canonical Forms -Triangular Form - Nilpotent Transformation

Canonical Forms: A Decomposition of V: Jordan form - Rational Canonical Form- Trace and Transpose -

Group Theory: Another Counting principle - Sylow's theorem - Application of Sylow's theorem - Direct products - Finite abelian Group.

Vector spaces and modules: elementary basic concepts - linear independence and bases - dual spaces -

Determinants - Hermitian - Unitary and Normal transformations - Real quadratic forms.

(17 hrs)

(18 hrs)

(17 hrs)

(17 hrs)

(17 hrs)

Text be	ook							
S. No	Author	Title of the book	Publishers	Year of Publication				
	I.N. Herstein	Topics in Algebra	2 nd edition, John Wiley & Sons	2016				
1.	Unit I : Chapter 2 – 2.11,2.12,2.13,2.14							
	Unit II : Chapt	ter 4- 4.1,4.2,4.3,4.4,4.5	5					
	Unit III: Chap	ter 5 – 5.1,5.3,5.5 ,5.6,5.	7 Chapter 7-7.1					
	Unit IV: Chap	ter 6-6.1,6.2,6.3,6.4,6.5						
	Unit V : Chap	ter 6 – 6.6,6.7,6.8,6.9,6.1	10,6.11					

References

S. No	Author	Title of the book Publishers		Year of
				Publication
1.	Lang Serge	Algebra	Addison-Wesley	2002
2.	P. B. Bhattacharya,	Basic Abstract Algebra	Cambridge	2009
	S. K. Jain and			
	S. R. Noyapal		University	
3.	Rao &Bhimsankaran	Linear Algebra	Hindustan book	2000
4.	Serge Lang	Linear Algebra	Addison-Wesley	2004
5.	S. Kumaresan	Linear Algebra	Prentice Hall	2000
6.	T. W. Hungerford	Algebra	Springer	2000

Pedagogy

Chalk and talk, Group Discussion, PPT, Seminar, Quiz, Assignment

Course Designers

1. Dr.T. Brindha, Associate Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH2202	REAL ANALYSIS	CORE	86	4	-	4

- > To present students the elements and importance of the real analysis.
- > To define and recognize the basic properties of the field of real numbers.
- > To enable the students to the differentiability of real functions and its related theorems.

Course Learning Outcomes

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

CLO Number	CLO Statement					
CLO1	Understand fundamental properties of the real numbers that lead to the formal development of real analysis	К2				
CLO2	Apply rigorous arguments developing the theory underpinning real analysis	K3				
CLO3	Analysis an understanding of limits and how they are used in sequences, series, differentiation and integration	K4				
CLO4	Evaluate the various mathematical proofs of basic results in real analysis	K5				
CLO5	Create how abstract ideas and various methods in mathematical analysis can be applied to important practical problems. Exhibits rigorous mathematical proofs in real analysis like inverse function theorem and the implicit function theorem	К6				

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	S	М	S
CLO 2	S	S	S	S	S
CLO 3	S	S	М	S	М
CLO 4	S	М	S	S	М
CLO 5	S	S	М	S	S

CORE II – SEMESTER I - REAL ANALYSIS (MTH2202)

Unit I

Riemann Stieltjes Integral: Definition and Existence of the integral - Properties of the integral - Integration and differentiation - Integration of vector valued function - Rectifiable curves.

Unit II

(18 Hrs)

(18Hrs)

Uniform convergence and Continuity - Uniform convergence and Integration - Uniform convergence and Differentiation - Equi continuous Families of Functions-The Stone-Weierstrass theorem Unit III (18Hrs)

Power Series - The Exponential and Logarithmic Functions - The Trigonometric Functions – The Algebraic completeness of the complex field- Fourier series- The Gamma Functions. Unit IV (16 Hrs)

Functions of Several Variables - Linear Transformation - Differentiation - The Contraction Principle. The inverse function Theorem

Unit V

(16Hrs)

The implicit Function Theorem-The Rank theorem-Determinants-Derivatives of higher order-Differentiation of Integrals

Text Book

S. No	Author	Title of the book	Publishers	Year of						
				Publication						
1.	W. Rudin	Principles of Mathematical Analysis	McGraw Hill	1976						
	UNIT: I – Chapter 6 – Sections: 6.1 – 6.27									
	UNIT: II – Chapter 7 – Sections: 7.7 – 7.26									
	UNIT: III – Chapter 8 – Sections: 8.1 – 8.22									
	UNIT: IV – Chapter 9 – Sections: 9.1 – 9.25									
	UNIT: V – Chaj	pter 9 – Sections: 9.26 – 9.42								

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	R.G.Bartle	Elements of real Analysis	John Wily and Sons	2006
2.	R. Goldberg Richard	Methods of real analysis	Oxford and IBH Publishing company	2014
3.	Siri Krishan Wasan	Real analysis	Tata McGraw Hill	2000
4.	H.L.Royden	Real Analysis	PHI Learning Private limited	2009

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment

Course Designer

1.Dr. K. Krishnaveni, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH2203	ORDINARY DIFFERENTIAL EQUATIONS	CORE	86	4	-	4

- Differential equations arise for many problems in oscillations of mechanical and electrical systems
- > It plays a very important role in all modern scientific and engineering studies.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge
Number		Levei
CLO1	Understand a variety of first order differential equations selecting from a variety of techniques	K2
CLO 2	Apply a variety of second order differential equations, selecting from several techniques	К2
CLO 3	Analysis the second order linear differential equations, both at ordinary points and at regular singular points	K3
CLO 4	Evaluate and be able to use various theoretical ideas and results that underlie the mathematics in this course covered in the syllabus (including various existence/uniqueness results, ideas of linear independence and the Wronskian, and convergence properties of Fourier series).	K5
CLO 5	Create the symbolic and graphical representations of functions	K6

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO 2	S	М	S	S	S
CLO 3	S	S	М	S	S
CLO 4	S	S	S	S	S
CLO 5	S	S	М	S	М

CORE III – SEMESTER I - ORDINARY DIFFERENTIAL EQUATIONS (MTH2203)

Unit I

Second order linear equations with ordinary points - Legendre equation and Legendre polynomials - Second order equations with regular singular points - Bessel equation.

Unit II

Systems of first order equation - Existence and uniqueness theorem - Fundamental matrix.

Unit III

Non-homogeneous linear systems - Linear systems with constant co-efficient - Linear systems with periodic co-efficients .

Unit IV

Successive approximation - Picard's theorem - non-uniqueness of solutions - continuation and dependence on initial conditions - Existence of solutions in the large - existence and uniqueness of solutions of systems.

Unit V

 $\label{eq:Fundamental} Fundamental results - Sturm's comparison theorem - Elementary linear oscillations - Comparison theorem of Hille-Winter oscillations of X" + A(t) X = 0. Elementary non-linear oscillations.$

(16 hrs)

rix.

(17 hrs)

(18 hrs)

(16 hrs)

(19 hrs)

Text book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S.G. Deo and	Ordinary differential	Tata Mc Graw hill	2002
	V.Raghavendra	equations and Stability	publishing company (P)	
		theory	Ltd, New Delhi,	
	Unit I : Chapter 3	- Section 3.2 - 3.5		
	Unit II: Chapter 4	- Section 4.1 - 4.4		
	Unit III: Chapter 4	- Section 4.5 - 4.7		
	Unit IV: Chapter 5	5 - Section 5.3 - 5.8		
	Unit V: Chapter 6	- Section 6.1 - 6.6		

References

S.No	Author	Title of Book	Publishers	Year of
				publication
1	Harry Pollard	Ordinary Differential Equations	Dover publication	2012
			Newyork.	
2	Edward L. Ince	Ordinary Differential Equations	Dover publication	2012
			Newyork.	
3	Wolfgang Walter	Ordinary Differential Equations	Springer Verlag,	2013
			Newyork INc-	
4	Earl A	An Introduction to Ordinary	Earl A. Coddington	2012
		Differential Equations	Prentice-Hall, –	
5	Refaat El Attar	Ordinary Differential Equations	LULU press incorporated	2006
			Morrisville USA	

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment

Course Designers

1. Dr.R. Sasirekha, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	MATHEMATICAL STATISTICS	CORE	86	4	-	4
MTH2204	MATHEMATICAL STATISTICS	COLL	00	•		•
D 11						

- > To enable the students to learn the different aspects of statistics.
- To provide them a systematic knowledge to analyze, organize, present and interpret any information effectively.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of statistics, probability and random variables	K2
CLO2	Apply the concepts in finding the moments of the distributions	K3
CLO3	Analysis the type of the distribution	K4
CLO4	Evaluate the basics of sampling distribution theory	K5
CLO5	Creating a good estimate using unbiased, sufficient, efficient estimates	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	М	S	S	S
CLO 2	S	S	S	М	S
CLO 3	S	S	М	S	S
CLO 4	М	S	S	S	S
CLO 5	S	S	М	S	S

CORE IV – SEMESTER I - MATHEMATICAL STATISTICS (MTH2204)

(16 Hrs)

(17 Hrs)

(19 Hrs)

(17 Hrs)

(17 Hrs)

Unit I

Limit Theorems: Preliminary remarks-Stochastic convergence-Bernoulli's law of large numbers-The convergence of a sequence of distribution functions - Levy Cramer theorem - De-Moivre Laplace theorem - Lindberg Levy theorem-Lapunov theorem.

Unit II

Markov chains: Preliminary remarks-Homogeneous Markov chains-The transition matrix-The Ergodic theorem- Random variables forming a homogenous Markov chain.

Unit III

Stochastic process: The notion of a stochastic process-Markov process and processes with independent increments-The Poisson process-The Furry-Yule process-Birth and death process- The Polya process-Kolmogorov equations.

Unit IV

Sample moments and their functions - The notion of the sample - The notion of a statistic - The distribution of the arithmetic mean of independent normally distributed random variables - The chi square distribution - The distribution of the statistic (X, S) - Student's t distribution - Significance tests - The concept of a statistical test - Parametric tests for small samples - Parametric tests for large samples - The chi square test- Independence test by contingency tables.

Unit V

Theory of estimation - Preliminary notions – Consistent – unbiased - sufficient and efficient estimates - asymptotically most efficient estimates - methods of finding estimates - Confidence intervals - Theory of hypothesis testing .

Text bo	l'ext book						
S. No	Author	Title of the book	Publishers	Year of Publication			
1	Marek Fisz	Probability Theory and Mathematical Statistics	Robert E. Krieger Publisher	1980			
	Unit I : Chap	ter 6 : 6.1-6.4, 6.6-6.9,		1			
	Unit II : Chap	ter 7 : 7.1-7.5.					
	Unit III: Chap	oter 8 : 8.1-8.7					
	Unit IV: Chapter 9: 9.1-9.6, Chapter 12:12.1-12.4,12.7						
	Unit V: Chaj	pter 13: 13.1-13.8					

Referen	Keferences					
S. No	Author	Title of the book	Publishers	Year of Publication		
1.	Ajai Gaur	Statistical methods for practice and research	Sage Publications	2010		
2.	John,A.Rice	Mathemtical and statistics and data analysis	Cengage Learning	2011		
3.	Robert V.Hoff and Allen T.Craig	Introduction to Mathematical Statistics	Pearson	2012		
4.	SC.Gupta	Fundamentals of mathematical statistics	Sultan Chand And Sons	2014		

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment

Course Designers

1. Dr.R.Meenambigai, Assistant Professor

COURSE NUMBER	COURSE NAME FINANCIAL MATHEMATICS	CATEGORY	L	T	Р	CREDIT
MTH22E1		ELECTIVE	86	4	-	4
D 11						

- > To derive price-yield relationship and understand convexity
- To understand about the decomposition of matrices in statistics (and probability) point of view, e.g. principle component analysis.
- > To understand the applications of financial mathematics.

Course Learning Outcomes

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

CLO	CLO Statement	Knowledg
Number		e Level
CLO1	Understand the advanced knowledge in probability,	
	statistics, stochastic calculus and	K2
	numerical methods for financial applications.	
CLO2	Demonstrate a broad knowledge of the financial securities as w	
	ell as practical aspects of risk management.	КJ
CLO3	Construct quantitative models for derivative pricing,	
	quantitative trading strategies,	K4
	risk management, and scenario simulations.	
CLO4	Communicate effectively with potential clients and peers	K5
CLO5	Use statistical techniques and methods in data analysis; understand the advantages and limitations of different methods.	K5

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	S	М	S
CLO 2	S	S	S	S	S
CLO 3	S	S	М	S	М
CLO 4	S	М	S	S	М
CLO 5	S	S	М	S	S

ELECTIVE I – SEMESTER I - FINANCIAL MATHEMATICS (MTH22E1) Unit I (16Hrs)

Single period models : Some definitions from finance - Pricing a forward -The one-step binary model-A ternary model - A characterisation of no arbitrage - The risk-neutral probability measure.

(17 Hrs)

(17 Hrs)

(17 Hrs)

(19 Hrs)

Unit II

Binomial trees and discrete parameter martingales : The multiperiod binary model - American options - Discrete parameter martingales and Markov processes - Some important martingale theorems The Binomial Representation Theorem - Overture to CLO ntinuous models.

Unit III

Brownian motion :Definition of the process - Levy's construction of Brownian motion - The reflection principle and scaling - Martingales in continuous time.

Unit IV

Stochastic calculus: Stock prices are not differentiable - Stochastic integration - Ito's formula -Integration by parts and a stochastic Fubini Theorem - The Girsanov Theorem - The Brownian Martingale Representation Theorem - Why geometric Brownian motion- The Feynman–Kac representation.

Unit V

The Black–Scholes model - The basic Black–Scholes model -Black–Scholes price and hedge for European options - Foreign exchange -Dividends -Bonds - Market price of risk.

Text Boo	Text Book							
S. No	Author	Title of the book	Publishers	Year of Publication				
	Alison	A Course in Financial	University of					
1	Etheridge	Calculus	Oxford					
	Unit I	Chapter I: 1.1 to 1.6	1					
	Unit II	Chapter II: 2.1 to 2.6						
	Unit III	Chapter III: 3.1 to 3.4						
	Unit IV	Chapter IV: 4.1 to 4.8						
	Unit V	Chapter V: 5.1 to 5.6						

Refere	nce Books			
S. No	Author	Title of the book	Publishers	Year of Publication
1	Robert J. Elliott, P. Ekkehard Kopp	Mathematics of Financial Markets	Springer-Verlag New York	1999
2	Steven Roman	Introduction to the Mathematics of Finance	Springer-Verlag New York	2012

Pedagogy

Lecture-Chalk & talk, LCD, Group discussion, Seminar, Quiz

Course Designer

1. Dr. K.Krishnaveni, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH22E2	GRAPH THEORY	ELECTIVE	86	4	-	4

- \blacktriangleright To present students the Basic concepts of graph theory.
- > To enable the students to find the practical applications to the real world problems etc.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Understanding of some network and colouring in Graph theory.	K2
CLO 2	Apply the understanding and used to model the atomic variable .	K3
CLO 3	Analysis the concepts of connectivity, Blocks and Hamilton cycles in the real life.	K4
CLO 4	Evaluate the concept and familiar with the concepts of colouring develop the reader to apply in day today life .	К5
CLO 5	Create some of the concepts in graph theory and the readers to apply in day today life.	К5

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	S	М	S
CLO 2	S	М	М	S	S
CLO 3	S	S	S	S	М
CLO 4	М	S	М	S	S
CLO 5	S	S	S	М	S

Unit I

ELECTIVE II - SEMESTER I - GRAPH THEORY (MTH22E2)

(16 hrs)

(16 hrs)

(18 hrs)

(18 hrs)

(18 hrs)

Graphs, Subgraphs : Graphs and Simple Graphs – Graph Isomorphism – The Incidence and Adjacency Matrices – Subgraphs – Vertex Degrees – Paths and Connection Cycles.

Trees: Trees- Cut Edges and Bonds - Cut Vertices - Cayley's Formula.

Unit II

Connectivity, Euler Tours And Hamilton Cycles: Connectivity – Blocks- Euler tours – Hamilton cycles.

Unit III

Matchings : Matchings - Matchings Coverings in Bipartite Graphs - Perfect Matching

Edge Colourings: Edge Chromatic Number – Vizing's Theorem.

Unit IV

Independent Sets, Cliques: Independent Sets- Ramsey's Theorem

Vertex Colourings: Chromatic Number – Brook's Theorem – Hajos Conjecture – Chromatic Polynomials – Girth and Chromatic Number.

Unit V

Planar Graphs: Plane and Planar Graphs – Dual Graphs – Euler's Formula- Bridges – Kuratowski's Theorem (Proof Omitted) – The Five Colour Theorem and The Four Colour Conjecture – Nonhamiltonian Planar Graphs – Directed Graphs: Directed Graphs – Directed Paths – Directed Cycles.

Text book

S. No	Author	Title of the book	Publishers	Year of Publication		
1.	J.A. Bondy and U.S.R. Murty	Graph theory with applications	Elsevier Publishing Co., Inc., New York	1976		
	Unit I : Chapter 1, Sections 1.1 to 1.7 & Chapter 2, Sections 2.1 to 2.4.					
	Unit II : Chapter 3, Sections 3.1 to 3.2 & Chapter 4, Sections 4.1 to 4.2					
	Unit III : Chapter 5, Sections 5.1 to 5.3 & Chapter 6, Sections 6.1 to 6.2					
	Unit IV : Chapter 7, Sections 7.1 to 7.2 & Chapter 8, Sections 8.1 to 8.5					
	Unit V : Chap	oter 9, Sections 9.1 to 9.7 & Chapter	10, Sections 10.1 to 10.3			

Reference Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1.	Nar Singh Deo	Graph Theory for	PHI, India	2016
		Computer Science and		
		Engineers		
		C		
2.	Reinhard Diestel	Graduate texts in	Springer.	2012
		mathematics, Graph		
		theory		
		-		
3.	Jonathan L.Gross , Jay yellen	Graph theory and its	Chapman and	2005
		application	hall	
4.	Gary Chartrand and ping zhang	A first course in graph	Springer	2013
		theory		

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment

Course Designers

1. Mrs. A. Neerajah, Assistant Professor

CATEGORY	L	Т	Р	CREDIT
CORE	71	4	-	4

- > To expose the students to the charm, niceties and nuances in the world of numbers.
- To present a rigorous development of Number Theory using axioms, definitions, examples, theorems and their proofs.
- > To highlight some of the applications of the theory of Numbers.

Course Learning Outcomes

Upon the successful completion of the course students will able to

CLO Number	CLO Statement	Knowledg e Level
CLO1	Demonstrate factual knowledge including the mathematical notation and terminology of number theory	K2
CLO2	Construct mathematical proofs of statements and find counterexamples to false statements in Number Theory.	К3
CLO3	Apply theoretical knowledge to problems of computer security	K4
CLO4	Analyze the logic and methods behind the major proofs in number theory.	K5
CLO5	Explore some current research problems in number theory	K5

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO 1	S	S	S	S	М
CLO 2	S	S	М	М	S
CLO 3	S	S	М	S	S
CLO 4	S	М	S	S	S
CLO 5	S	S	S	М	М

CORE V – SEMESTER II - NUMBER THEORY (MTH2205)

Unit-I

Residue classes, Linear Congruences with applications, Fermat's theorem, Euler's theorem, Chinese Remainder theorem, Wilson's theorem, the order of an integer modulo n and existence of primitive roots.

Unit-II

Quadratic congruences, quadratic residues and nonresidues, Euler's criterion, The Legendre symbol and its properties, quadratic reciprocity, Gauss's Lemma, Jacobian symbol and its properties with applications.

Unit-III

Perfect numbers, the group of arithmetic functions, Mobius inversion formula with applications, Fermat numbers and Mersenne numbers.

Finite and infinite simple continued fractions, rational approximations of real numbers

Unit-IV

Diophantine linear equations, Pythagorean triples, Gaussian integers, primes as sum of squares the case n = 4 in Fermat's Last theorem, Pell's equation continued fraction solution of Pell's equation.

Unit-V

Analytic Number Theory- Sum of reciprocals of primes-order of growth of function-Chebyshev's theorem- Bertrand's postulate- the prime number theorem- the Zeta function and Riemann hypothesis

S. No	Author	Title of the book	Publishers	Year of			
				Publication			
1.	Erickson and Vazzana	Introduction to Number Theory	Chapman & Hall/CRC	2009			
	UNIT – I Chapter III : Sections 3.1 to 3.8 UNIT – II Chapter V: Sections 5.1 to5.5. UNIT – III Chapter VI & VII: Sections 6.1 to 6.4. 7.2 -7.3 and Chapter VIII: Sections 8.1 to 8.4 UNIT – IV Chapter IX : Sections 9.1 to 9.7						

Text Book

(13 Hrs)

(16 Hrs)

(14 Hrs)

(14 Hrs)

(14 Hrs)

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Thomas Koshy	Elementary number theory with applications	Academic Press	2005
2.	John Stillwell	Elements of number theory	Springer	2002
3.	Melvyn B Nathanson	Methods in number theory	Spring India Ltd	2005
4.	David M Burton	Elementary number theory	Mc Graw Hill Education	2012

Pedagogy

Chalk and talk, Group Discussion, PPT, Seminar, Quiz, Assignment

Course Designers

1.Dr. T. Brindha, Associate Professor

COURSE	COURSE NAME LEBESGUE MEASURE THEORY	CATEGORY	L	Т	Р	CREDIT
MTH2206		CORE	71	4	-	4

- ➤To introduce the concepts of measure and integral with respect to a measure, to show their basic properties, and to provide a basis for further studies in Analysis, Probability, and Dynamical Systems.
- >To gain understanding of the abstract measure theory and definition and main properties of the integral.
- ➤To construct Lebesgue's measure on the real line and in *n*-dimensional Euclidean space. To explain the basic advanced directions of the theory.

Course Learning Outcomes

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

CLO	CLO Statement	Knowledge
Number		Level
CLO 1	Understand the basics axioms for the real numbers, natural and rational numbers	
	as subset. Demonstrate the basic concepts underlying the definition of the general	K2
	Lebesgue integral.	
CLO 2	Apply the concepts of Borel sets, measurable functions, differentiation of	V2
	monotone functions	KJ
CLO 3	Analyse about the little wood's theorem, integral of a non-negative function,	V A
	functions of bounded variation	K4
CLO 4	Evaluate a clear idea about convergence in measure, differentiation of an integral,	<i>V</i> 5
	absolute continuity and convex functions	KJ
CLO 5	Create the theory of the course to solve a variety of problems at an appropriate	V6
	level of difficulty	KÜ

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	М	S	S
CLO 2	S	М	S	М	S
CLO 3	S	S	S	М	S
CLO 4	S	S	S	S	М
CLO 5	S	S	М	S	S

CORE VI – SEMESTER II - LEBESGUE MEASURE THEORY (MTH2206)

Unit I

The Real number system: Axioms for the real numbers- The natural and rational numbers as subset of R-The extended real numbers-Sequence of real numbers-open and closed sets of real numbers-continuous functions-Borel sets.

Unit II

Lebesgue Measure: Outer measure - Measurable sets and Lebesgue measure - Measurable functions - The Little wood's theorem.

Unit III

The Lebesgue Integral: The Lebesgue integral of a bounded function over a set of finite measure -Integral of a non-negative function - General Lebesgue integral - Convergence in measure.

Unit IV

Differentiation and Integration: Differentiation of monotone functions-Functions of bounded variation-Differentiation of an integral - Absolute continuity-Convex functions

Unit V

The classical banach spaces: the L^p spaces- The Minkowski and holder inequalities-Convergence and completeness-Approximation in L^p.

(14Hrs) ers as

(14Hrs) Measurab

(15Hrs)

(14 Hrs)

(14 Hrs)

Text Bo	ext Book							
S. No	Author	Title of the book	Publishers	Year of Publication				
1	U.I. Dourdon	Deel Analysis	DIII Learning Driveta limited	2000				
1.	H.L.Koyden	Real Analysis	PHI Learning Private limited	2009				
	UNIT: I – Chapter 2– Sections: 1-7							
	UNIT: II – Chapte	er 3 – Sections: 1-3, 5,	6					
	UNIT: III – Chapter 4– Sections: 1-4							
	UNIT: IV – Chapter 5– Sections: 1-5							
	UNIT: V – Chapte	er 6 – Sections: 1-4						

Reference Books

ittit	Tenee Books			
S. No	Author	Title of the book	Publishers	Year of Publication
1.	R.G.Bartle	Elements of real Analysis	John Wily and Sons	2006
2.	R. Goldberg Richard	Methods of real analysis	Oxford and IBH Publishing co	2014
3.	Siri Krishan Wasan	Real analysis	Tata McGraw Hill	2000
4.	W.Rudin	Principles of Mathematical Analysis	McGraw Hill	2002

Pedagogy :

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment

Course Designer

1. Mrs.K. Sharmilaa, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH2207	PARTIAL DIFFERENTIAL EQUATIONS	CORE	71	4	-	4

- > To present students the elements of the theory of partial differential equation.
- ≻To introduce different methods for solving partial differential equation.
- To enable the students to find solution of partial differential equation of practical application like engineering, physics etc.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of first and second order partial differential equation of and different methods of solving pde's	K2
CLO2	Apply PDEs, apply analytical methods, and physically interpret the solutions.	К3
CLO3	Analyse and validate mathematical models of practical problems related to other fields.	K4
CLO4	Evaluate the boundary values problems and point out its significance	K5
CLO5	Create the knowledge of partial differential equations for modelling the general structure of solutions and using analytic methods for solutions.	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	S	S	М
CLO 2	S	S	М	S	S
CLO 3	S	М	S	S	S
CLO 4	S	S	S	S	S
CLO 5	S	S	М	S	S

CORE VII – SEMESTER II - PARTIAL DIFFERENTIAL EQUATIONS (MTH2207) Unit I (15 Hrs)

Nonlinear Partial Differential Equations of the first order - Cauchy's method of Characteristics -Compatible System of First order equations- Charpit's method - Special types of First Order equations -Jacobi's method.

Unit II

Partial Differential Equations of second order - The origin of Second-order Equations - Linear Partial Differential Equations with constant coefficients – Equations with variable coefficients

Unit III

The solution of Linear Hyperbolic Equations - Separation of variables - The Method of integral transforms - Non linear Equation of the second order.

Unit IV

Laplace's equation - The occurrence of Laplace's Equation in Physics - Elementary solution of Laplace's Equation - Families of Equipotential surfaces - Boundary value problems - Separation of variables - Problems with axial symmetry.

Unit V

The wave Equation -The occurrence of wave equation in physics – Elementary solution of the one-dimensional wave equation - Vibrating Membranes: Application of the calculus of variations -Three dimensional problems. The diffusion equations: Elementary solutions of the diffusion Equation -Separation of variables - the use of Integral transforms.

(14 Hrs)

(14 Hrs)

(14 Hrs)

(14 Hrs)

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication			
				1 uprication			
1.	Ian N.Sneddon	Elements of Partial	McGraw-Hill	2006			
		Differential Equations	International				
			Edition				
	Unit I : Chapter 2	Sections 7,8,9,10,11 and 13					
	Unit II : Chapter 3	Sections 1, 4, 5 and 6					
	Unit III: Chapter 3 Sections 8,9,10 and 11						
	Unit IV: Chapter 4 Sections 1, 2,3,4,5 and 6						
	Unit V : Chapter 5	Sections 1, 2, 4 and 5, Chapter	6 Sections 3, 4 and 5				

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Raisinghania.M D	Ordinary and partial differential equation	S.Chand Company, 9 th edition	2005
2.	Vairamanickam K and Etal	Transforma and partial differential equations	Scitech Publications India Pvt Ltd, 2 nd edition	2009
3.	Nita H Shah	Ordinary and partial differential equations	Phi Learning Private Ltd	2010
4.	Sankara Rao	Introduction to partial differential equations	Phi Learning Private Ltd	2011
5.	Veerarajan T	Transforms and partial differential equations	TataMcGrawHillEducation Private Limited	2011

Pedagogy :

Chalk & talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

1. Dr. R. Sasirekha, Assistant Professor

COURSE	COURSE NAME MECHANICS	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH2208		CORE	86	4	-	5

- To develop familiarity with the physical concepts and facility with the mathematical methods of classical mechanics.
- > To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
- > To develop skills in formulating and solving physics problems

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the knowledge of CLO re principles in mechanics	K2
CLO 2	Apply complex and difficult problems of classical dynamics in a systematic way	К3
CLO 3	Analysis the variation principle for real physical situations	K4
CLO 4	Evaluate the existing symmetries and the corresponding integrals of motion and analyze the qualitative nature of dynamics	K5
CLO 5	Create problem solving skills (approach, estimation, computation, and analysis) of classical mechanics in various contexts such as mechanical engineering, astrophysics, and biophysics.	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	М	S	S	S	М
CLO 2	S	S	S	М	S
CLO 3	S	S	М	S	S
CLO 4	S	М	S	S	S
CLO 5	S	S	S	S	М

CORE VIII – SEMESTER II - MECHANICS (MTH2208)

UNIT I

Introductory concepts: Mechanical system - generalized coordinates - constraints - virtual work - energy and momentum.

UNIT II

Lagrange's equations: Derivations of Lagrange's equations - examples - integrals of motion.

UNIT III

Hamilton's equations: Hamilton's principles - Hamilton's equations - other variational principles.

UNIT IV

Hamilton – Jacobi theory: Hamilton's principle function - Hamilton - Jacobi equation - Separability.

UNIT V

Canonical transformations: Differential forms and generating functions - Lagrange and Poisson brackets.

(18 hrs)

(17 hrs)

(17 hrs)

(17 hrs)

(17 hrs)

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Donald	Classical Dynamics	Dover	1997
	T.Greenwood		Publications	
	UNIT I : Chapter	:1		·
	UNIT II : Chapter	r 2: Sections 2.1-2.3.		
	UNIT III : Chapte	r 4: Sections: 4.1-4.3.		
	UNIT IV : Chapte	r 5		
	UNIT V : Chapter	r 6: Sections: 6.1-6.3.		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	H.Goldstein	Classical Mechanics	2nd Edition, Narosa Publishing House, New Delhi	2001
2.	David Morin	Introduction to classical mechanics	Cambridge Press	2008
3.	Takwal R G and Puranik P S	Introduction to classical mechanics	Mcgraw Hill Education Private Limited	2010
4.	Sankara Rao K	Classical mechanics	Phi Learning Pvt Ltd	2011
5.	Rajneesh Goel	Classical mechanics	Anmol Publication Pvt Limited, 1 st edition	2014

Pedagogy:

Chalk & talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

Dr. K. Krishnaveni, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH22E3	CONTROL THEORY	ELECTIVE	56	4	-	3

The objective of this course is to introduce some fundamental concepts of control system including state space techniques, optimal control, stability analysis and controllability.

The course is intended to provide students with confidence in own abilities to analyze and design a new control system.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Understand the basic concepts and properties of differential equations, fundamental concepts of control system	K2
CLO 2	Apply the concept of observable and controllable system.	К3
CLO 3	Analyze and design a new control system.	K4
CLO 4	Evaluate the system stability, equilibrium points, linear system stability	K5
CLO 5	Create optimal control to statement of the optimal control problems and interpret the problems	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	М	S	S
CLO 2	S	S	S	М	S
CLO 3	S	М	S	S	S
CLO 4	S	S	S	S	М
CLO 5	S	М	S	S	S

ELECTIVE III – SEMESTER II - CONTROL THEORY (MTH22E3)

Unit I

Observability: Linear systems - Observability Grammian - Constant coefficient systems - Reconstruction Kernel - Nonlinear Systems.

Unit II

Controllability: Linear Systems - Controllability Grammian - Adjoint Systems - Constant coefficient systems - Steering function - Nonlinear systems.

Unit III

Stability: Stability - Uniform Stability - Asymptotic Stability of Linear Systems - Linear time varying systems - Perturbed linear systems- Nonlinear systems.

Unit IV

Stabilizability: Stabilization via linear feedback control - Bass method - Controllable subspace - Stabilization with restricted feedback.

Unit V

Optimal Control: Linear time varying systems with quadratic performance criteria - Matrix Riccati equation - Linear time invariant systems - Nonlinear Systems.

(11 Hrs)

(12 Hrs)

(11 Hrs)

(11 Hrs)

(11 Hrs)

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	K.Balachandran and J.P.Dauer	Elements of Control Theory	Narosa, New Delhi	2012
	Unit I : Chapter 2- Sec Unit II : Chapter 3- Se Unit III : Chapter 4- Se Unit IV : Chapter 5- Se Unit V : Chapter 6- Se	ctions : 2.1-2.2 ctions : 3.1-3.2 ections : 4.1- 4.3 ections : 5.1- 5.3 ctions : 6.1- 6.3		

Reference Books

S.	Author	Title of the book	Publishers	Year of
No				Publication
				• • • • •
1.	Mike Mesterton	A primer on the calculus	American	2009
		of variations and optimal	Mathematical Society	
		control		
2.	Deo S G Etal	Text book of ordinary	American	2010
		differential equations	Mathematical Society	
3.	Arnold V I	Ordinary differential	Phi Learning Private	2009
		equations	Limited	
4.	P.K.Ghosh,	Linear Control Systems	Platinum Publishers	2015
	Satyajit Anand			
5.	A.K.Jairath	Problems and Solutions of	CBS Publishers	2015
		Control Systems : With		
		Essential Theory		

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, Assignment

Course Designers

1. Dr. R. Anitha Cruz, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH22E4	STOCHASTIC PROCESSES	ELECTIVE	56	4	-	3

- > To enable the students to learn the different aspects of statistics.
- To provide them a systematic knowledge to analyze, organize, present and interpret any information effectively.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic concepts of Stochastic process, Markov chains	K2
CLO2	Apply the concepts in finding the moments of the distributions	K3
CLO3	Identify the type of the distribution	K4
CLO4	Understand the basics of sampling distribution theory	K5
CLO5	Emphasis on estimating a good estimate using unbiased, sufficient, efficient estimates	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	М	S	S	S
CLO 2	S	S	S	М	S
CLO 3	S	S	М	S	S
CLO 4	М	S	S	S	S
CLO 5	S	S	М	S	S

ELECTIVE IV – SEMESTER II - STOCHASTIC PROCESSES (MTH22E4) UNIT I (12 Hrs)

Elements of Stochastic Process: Review of basic terminology and Properties of random variables and distribution functions – Two simple examples of Stochastic Process - Classification of general Stochastic Process – Defining a Stochastic Process. **Markov Chains** : Definitions - Examples of Markov Chains – Transition probability matrices of a Markov Chains – Classification of states of Markov Chains – Recurrence – Examples of recurrent Markov Chains

UNIT II

The Basic limit theorem of Markov Chains and Applications: Discrete renewal equations – Proof of Theorem 1.1 – Absorption Probabilities – Criteria for recurrence – A Queueing example – Another Queueing model – Random walk. **Classical examples of Continuous time Markov Chains** : General pure Birth processes and Poisson processes - A counter model – Birth and Death processes – Differential equations of Birth and Death processes – Birth and Death processes with absorbing states – Finite state continuous time Markov Chains

UNIT III

Renewal Processes: Definition of a Renewal process and related concepts – Some special renewal process and examples – Renewal equations and Elementary Renewal Theorem – Renewal theorem – Applications of The Renewal theorem – Generalizations and variations on Renewal processes. **Brownian Motions** : Background material – Joint probabilities for Brownian Motions – Continuity of paths and the Maximum Variables – Variations and Extensions – Computing some functional of Brownian Motions by Martingale methods – Multi Dimensional Brownian Motions - Brownian paths

UNIT IV

Branching Processes : Discrete Time Branching Processes – Generating function relations for Branching Processes – Extinction probabilities – Examples – Two type Branching Processes – Multi type Branching Processes – Continuous time Branching Processes – Extinction probabilities for Continuous time Branching Processes – Limit Theorems for Continuous time Branching Processes

UNIT V

Stationary Processes: Definitions and Examples – Mean square distance – Mean square error prediction – Prediction of Covariance Stationary Processes – Ergodic Theory and Stationary Processes – Applications of Ergodic Theory

(11 Hrs)

(11 Hrs)

(11 Hrs)

(11 Hrs)

Text boo	ext book							
S. No	Author	Title of the book	Publishers	Year of Publication				
1	Samuel Karlin	A First Course in	Academic Press,					
	and Howard M.	Stochastic Processes	New york, Second					
	Taylor		edition.					
	Unit I : Chapter : 1,2	2	·					
	Unit II : Chapter : 3,4							
	Unit III: Chapter : 5	,7						
	Unit IV: Chapter : 8							
	Unit V: Chapter: 9							

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	HenkC.Tijms	A first course in Stochastic Models	Wiley	2003
2.	Jochen Geiger	Applied Stochastic Process	E book	2007
3.	Jothi prasath mary	Stochastic Process		

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment Course Designer

1. Mrs. K. Sharmilaa, Assistant Professor

IDC SYLLABUS

M.Com – Quantitative Techniques for Commerce (MTH18A3)

M.Sc (CS & IT) – Statistical Techniques in Practice (MTH19A5)

ALLIED SYLLABUS

B.COM (PA) –Quantitative Aptitude –Statistics (TH21A19)BSC CS & AI - Linear Algebra (TH22A25)BSC CS & AI - Statistics for Computer Science I (TH21A26)

NUMBER MTH18A3QUANTITATIVE TECHNIQUES FOR COMMERCEIDC753	COURSE	COURSE NAME QUANTITATIVE TECHNIQUES FOR COMMERCE	CATEGORY	L	Т	Р	CREDIT
	NUMBER MTH18A3		IDC	75	-	-	3

- > To present the Basic concepts of Statistics.
- > To introduce different methods for solving statistical method and operation research.
- Enable the students to find the practical applications to the real world problems etc.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledg e Level
CLO 1	Identify the source of quantifiable problems, recognize and solve. Understand and apply basic concepts and describe mathematical relations and functions.	K2
CLO 2	Apply the concepts of Quantitative Techniques to solve the problems.	K3
CLO 3	Determine the correct statistical method and optimization techniques to analyze and evaluate the problems.	K4
CLO 4	Formulate and interpret the problems by available techniques.	K5
CLO 5	Evaluate problems by using statistical method and optimization techniques. Apply quantitative techniques to commercial problem and analyze the results.	K6

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	M	S	S	S	S
CLO 2	S	S	S	S	S
CLO 3	S	S	М	S	S
CLO 4	S	S	S	S	S
CLO 5	S	S	S	S	S

SEMESTER II- M.Com – IDC

QUANTITATIVE TECHNIQUES FOR COMMERCE (MTH18A3)

Unit I

Quantitative approach to management- sets- events- probability-addition and multiplicationtheories – conditional probability- Mathematical expectation- Baye's theorem.

Unit II

Binomial - Poisson and normal distribution (without derivations & proof - properties). Fitting of these distributions - Correlation - Rank correlation - Regression and regression lines on x and y.

Unit III

Test of significance - Large sample test - small sample test - application of chi - Square test - 't' & 'F'distribution.

Unit IV

Operation research : origin - meaning - definition - model - Phases - general linear programming - graphical method - simplex method (slack) variable - Transportation problem - method of initial & optimum solutions.

Unit V

Queuing theory: Problems from single server - finite and infinite population. Assignment and traveling salesman problems - Network analysis - critical path method - PERT.

(15Hrs)

(15Hrs)

(12Hrs)

(11Hrs)

(14 Hrs)

Text books

S. No	Author	Title of the book	Publishers	Year of			
				Publication			
	Man Mohan, P.K.	Operations Research	Sultan Chand &	2005			
1.	Gupta, Kanti		Sons				
	Swarup						
	Unit 4: Chapter 1 se	ction $1.1 - 1.6$, Chapter 2 section 2.1	-2.2	1			
	Chapter 3 section $3.1 - 3.5$, Chapter 4 section $4.1, 4.3$						
	Chapter 10 section 10.1 – 10.10 (exclude 10.4)						
	Unit 5 : Chapter 20 s	section 20.1 – 20.8 Model I & III					
	Chapter 11 s	section 11.1 – 11.6(exclude 11.5)					
	Chapter 21 s	section 21.1 – 21.7					
2.	S.P. Gupta	Statistical Methods	Sultan Chand &	2004			
			Sons				
	Unit 1 : Volume II: (Chapter 1- pg nos:753-803					
	Unit 2 : Volume II: Chapter 2- pg nos:809-824,826-835,836-879						
	Unit 3 : Volume II: Chapter: 3- pg nos:901-907,910-922						
	Volume II: Chapter: 4- pg nos:954-969						
	Volume II:	Chapter: 5- pg nos:1005-1038					

References

S. No	Author	Title of the book	Publishers	Year of
				Publication
1	J.K Sharma	Quantitative Techniques	Trinity Press	2014
		In Management		
2	Kalavathy S	Operation research with c	Vikas Publishing	2010
		programs	House	
3	R.Veerachamy	Quantitative methods For	New Age International	2010
		Economists	Publishers	
4	Ajai Gaur	Statistical methods for	Sage Publications	2010
		practice and research		
5	S.C.Gupta& V.K	Fundamentals of	Sultan Chand & Sons	2014
	Kapoor	Mathematical Statistics		

Pedagogy

Chalk & talk, PPT, Group discussion, Seminar, Quiz, assignment

Course Designers

1. Dr. R. Anitha Cruz, Assistant Professor

- \triangleright To understand the practical applications in solving problems of Statistical Mathematics. \triangleright
 - To use Statistical tools effectively to solve problems involving Statistics

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO 1	Learn the basics of Probability	K2
CLO 2	Understand the properties of Statistical Distributions	К3
CLO 3	Use basic combinatorial techniques to calculate probabilities,	K4
CLO 4	Learn to use Statistical tests and sampling theory.	K5
CLO 5	Explain practical implications of expectation and variance and how they predict the shapes of distribution and density (mass) functions of a random Variable	K5

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	S	М	S
CLO 2	S	S	S	S	S
CLO 3	S	S	М	S	М
CLO 4	S	М	S	S	М
CLO 5	S	S	М	S	S

SEMESTER II IDC – M.Sc(CS) & M.Sc(IT) STATISTICAL TECHNIQUES IN PRACTICE(MTH19A5)

(11hrs)

(11hrs)

(12 hrs)

(11hrs)

(11hrs)

UNIT I

Probability-addition and multiplication theorems- problemsconditionalprobability- mathematical expectations- Bayer's theorem and random variable and probability distribution.

UNIT II

Theoretical distribution: binomial Poisson and normal distribution. Test of hypothesis and significance of large samples.

UNIT III

Test of significance for small samples goodness of fit χ^2 , F distributions– applications. ANOVA (one and two wayclassification).

UNIT IV

Sampling- statistical Quality control- control charts- single- double sampling plansacceptance- sampling theory.

UNIT V

Partial and multiple correlation- significance of partial correlation- multiple regression analysis.

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1	S.P. Gupta	Statistical Methods	Sultan Chand & Sons	2005
	Unit I : Chapter 1 -			
	Unit II : Chapter 2-	Pg 806-853,882-910		
	Unit III: Chapter 3	– Pg :910-915		
	Chapter 4	Pg : 954- 1001		
	Chapter 5	- Pg: 1006-1016,1019-1038		
	Unit IV : Chapter 7	7- Pg : 1052- 1091		
	Unit V: Chapter	9- Pg: 1110-1123		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1	R.S.N Pillai and	Statistics	S. Chand &	2008
	V.Bhagavathi		Company LTD	
2	PA Navaneetham	Business Mathematics and	Jai publishers	2017
		Statistics		

Course Designers

1. Dr.C.R.Parvathy, Associate Professor

COURSE	COURSE NAME	CATEGORY	L	Т	P	CREDIT
NUMBER	QUANTITATIVE APTITUDE -	ALLIED	86	4	-	5
TH21A18	MATHEMATICS					

- To provide the use of mathematical process skills to identify, pose and solve problems creatively and critically.
- To make students to understand mathematical principles with theoretical concepts and problems.
- To provide the wide knowledge of real time applications and to clear the competitive exams.
- On the successful completion of the course students will be

Course Learning Outcomes

CLO	CLO Statement	Knowledge
Number		Level
CLO 1	Acquires the knowledge of equation, interest and	К1
	simple concept of logic	
CLO 2	Understand the basic principles of interest, sequence of problems.	K1
CLO 3	Interpret and apply knowledge of mathematics through differential calculus and integration.	K2
CLO 4	Identify, formulate and solve the problems.	K3
CLO 5	Understand the concepts of limit and continuity.	K3

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	М	S	М	S	М
CLO 2	М	S	М	S	S
CLO 3	S	S	М	М	S
CLO 4	М	S	М	М	S
CLO 5	М	S	М	М	S

B.COM (PA) – ALLIED - QUANTITATIVE APTITUDE – MATHEMATICS(TH21A18)

Unit I

Ratio and Proportion – surds - indices - variation – logarithms: Meaning - definition - related problems.

Unit II

Equations:Introduction - simple equation - simultaneous linear equations up to three variables – Quadratic equation - nature of roots - cubic equation - graphical solution of linear equations.

Unit III

Simple and Compound Interest -Definition - related terms - Effective rate of Interest – Annuity - Future value - present value - sinking fund - problems - applications - Permutations and combinations: Introduction - factorial - permutations - results - Problems - circular permutations combinations - results - problems.

Unit IV

Sequences and Series: Sequence - Series - Arithmetic progression - Geometric progression - Geometric mean. Sets - Functions and relations:Sets - De Morgan's law, Domain and range of function - various types of functions.

Unit V

Limits and Continuity:Introduction - types of functions - concepts - important limits continuity Basic concepts of differential and integral calculus:Introduction -differential coefficient - implicit functions - parametric form - Integration:Basic Formulae - methods of substitution - integration by parts - method of partial fraction - important properties.

(17 Hrs)

(18 Hrs)

(17 Hrs)

(16 Hrs)

(18 Hrs)

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Dr.P.C. Tulsian	Quantitative Aptitude for CA CPT –Mathematics and Statistics	S.CHAND	2015

References

S. No	Author	Title of the book	Publishers	Year of Publication
1.	PradeepJha,Parag Shah	Quantitative Aptitude for CA CPT - Mathematics and Statistics	Tata McGraw Hill	2009
2.	AnupDubey	Quantitative Aptitude for CA CPT- Mathematics and Statistics	S.CHAND	2014
3.	Trivedi	Quantitative Aptitude for CA CPT- Mathematics and Statistics	Tata McGraw Hill	2009
4.	CA-CPT Study Material	Quantitative Aptitude for CA CPT- Mathematics and Statistics	ICAI	2015

Pedagogy

Chalk & Talk, PPT, Assignment, Seminar, Quiz

Course Designers:

1. Mrs.A. Neerajah, Assistant professor

CATEGORY	L	Т	Р	CREDIT
ALLIED	86	4	-	5

- To provide the use of mathematical process skills to identify, pose and solve problems creatively and critically.
- To make students to understand statistical principles with theoretical concepts and problems.
- To provide the wide knowledge of real time applications and to clear the competitive exams.

Course Learning Outcomes

On the successful completion of the course students will be

CLO	CLO Statement	Knowledge
Number		Level
CLO 1	Acquires the basic concepts of data description and its representation	K1
CLO 2	Understand the basic principles of sampling theory	K1
CLO 3	Understand the role as well as the distinction between discrete and continuous data	K2
CLO 4	Apply the skills of data analysis and emphasis on understanding variation, collecting information in the face of uncertainty, checking distributional assumptions	K2
CLO 5	Apply probability as a tool for anticipating the distribution of data and using appropriate method to draw conclusions.	K3

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
CLO 1	S	S	М	S	S
CLO 2	S	S	М	S	S
CLO 3	S	S	М	S	S
CLO 4	S	S	S	S	S
CLO 5	S	S	М	S	S

B.COM (PA) –QUANTITATIVE APTITUDE –STATISTICS (TH21A19)

Unit I

Statistical description of data: Textual - Tabular - Diagrammatic representation of Data - frequency distributions - Graphical representation of data - Frequency Polygon - Ogive.

Unit-II

Measures of Central tendency and Dispersion:Introduction - mean - median - partition

values - mode - Geometric mean - harmonic mean - standard deviation - quartile deviation

- correlation - regression.

Unit-III

Probability and expected value by mathematical expectation - Definition problems - Theoretical Distributions:Binomial - Poisson - Normal. Unit-IV (16 Hrs)

Sampling Theory: Basic Principles of sampling theory. Comparison between sample survey and complete enumeration - Errors in sample survey - some important terms associated with sampling - Types of sampling - Theory of estimation -Determination of sample size

Unit V

Index Numbers:Definition of index number - uses - problems in the construction of index numbers - cost of living index numbers.

MTH 52

(18 Hrs)

(18 Hrs)

(17 Hrs)

(17 Hrs)

Text books

S. No	Author	Title of the book	Publishers	Year of Publication
1	Dr.P.CTulsian	Quantitative Aptitude for CA CPT- Mathematics and Statistics	S.CHAND	2015

References

S. No	Author	Title of the book	Publishers	Year of Publication
1.	PradeepJha,Parag Shah	Quantitative Aptitude for CA CPT- Mathematics and Statistics	Tata McGraw Hill	2009
2.	AnupDubey	Quantitative Aptitude for CA CPT- Mathematics and Statistics	S.CHAND	2014
3.	Trivedi	Quantitative Aptitude for CA CPT- Mathematics and Statistics	Tata McGraw Hill	2009
4.	CA-CPT Study Material	Quantitative Aptitude for CA CPT- Mathematics and Statistics	ICAI	2015

Pedagogy Chalk & Talk, PPT, Assignment, Seminar, Quiz Course Designers:

1. Dr. R. Sasirekha, Assistant professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	ALLIED - LINEAK ALGEDKA	ALLIED	86	4	-	5
TH22A25	SEMESTER I					

- To present students the Basic concepts of linear algebra. \triangleright
- To enable the students to find the practical applications to the real world problems. \succ

Course Learning Outcomes

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

CLO	CLO Statement	Knowledge
Number		Level
CI O1	Develop the use of matrix algebra techniques which is needed by engineers	V1
CLOI	Develop the use of matrix algebra techniques which is needed by engineers	K1
	for practical applications	
CLO2	Apply the tools of vectorspaces to decompose complex matrices into	K2
CLO3	Recognize and use basic properties of subspaces and vector spaces	K3
CLO4	Understand the concept of real and complex inner product spaces and their applications in constructing approximations and orthogonal projections	К3
CLO5	Compute eigen values and eigen vectors and use them to diagonalize matrices and simplify representation of lineat transformations	K4
Manning w	th Programma Learning Outcomes	

Mapping with Programme Learning Outcome

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	М	S	S	S
CLO2	S	S	М	S	S
CLO3	S	S	S	М	S
CLO4	S	S	S	S	М
CLO5	S	М	S	S	S

UNIT I

B.Sc CS(AI)

LINEAR ALGEBRA

Linear Equations and Matrices : Systems of Linear Equations, Gaussian Elimination, Vector Arithmetic, Arithmetic of Matrices, Matrix Algebra, The Transpose and Inverse of a Matrix, Types of Solutions, The Inverse Matrix Method

UNIT II

Euclidean Space: Properties of Vectors, Further Properties of Vectors, Linear Independence, Basis and Spanning Set

UNIT III

General Vector Spaces: Introduction to General Vector Spaces, Subspace of a Vector Space, Linear Independence and Basis, Dimension

UNIT IV

Inner Product Spaces: Introduction to Inner Product Spaces, Inequalities and Orthogonality, Orthonormal Bases, Orthogonal Matrices

UNIT V

Eigen values and Eigenvectors: Determinant of a Matrix, Introduction to Eigen values and Eigenvectors, Properties of Eigen values and Eigenvectors, Diagonalization, Diagonalization of Symmetric Matrices

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S. No	Author	Title of the book	Publishers	Year of Publication
1.	Kuldeep Singh	Linear Algebra Step by Step	Oxford University Press	2014
	Unit I : Chapter I			
	Unit II: Chapter II			
	Unit-III : Chapter III	3.1-3.4		
	Unit-IV: Chapter IV			
	Unit-V: Chapter VI	- 6.1, Chapter VII -7.1-	7.4	

(17 hrs)

(17 hrs)

(17 hrs)

(17 hrs)

(18 hrs)

Refere	Reference Books							
S. No	Author	Title of the book	Publishers	Year of Publication				
1.	Gilbert Strang	Introduction to Linear Algebra	Wellesley-Cambridge Press	2016(5 th Edition)				
2.	David C. Lay, Steven R. Lay, Judi J. McDonald.	Linear Algebra and Its Applications,	Pearson Education	(2014)				
3.	David C.Lay.Steven r.Lay.JudJ.McDona ld	Linear Algebra and Its Applications,	Pearson	2014 5 th Edition,				
Note								

Question paper setters to confine to the above text books only

MOOC learning

https://nptel.ac.in/courses/111/106/111106051/#

Lecture 1: Systems of Linear Equations, Gaussian Elimination

Lecture 2: Introduction to General Vector Spaces, Subspace of a Vector Space

Lecture 3: Linear Independence, Basis and Spanning Set

Lecture 9: Introduction to Inner Product Spaces, Inequalities and Orthogonality

Lecture 6: Introduction to Eigenvalues and Eigenvectors, Properties of Eigenvalues and Eigenvectors, Diagonalization, Diagonalization of Symmetric Matrices

Pedagogy

Chalk and talk, ppt, Group discussion, Seminar, Quiz, Assignment

Course Designers

Dr.C.R.Parvathy, Associate Professor, Department of Mathematics

COURSE NUMBER TH21A26	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
	COMPUTER SCIENCE I	ALLIED	86	4	-	5
	SEMESTER II					

This course introduces the fundamental concepts of probability and random variables .It also provides knowledge in discrete and continuous distributions. It deals with various sampling distributions like t, F, chi-square distributions etc..

Course Learning Outcomes

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

CLO	CLO Statement	Knowledge
Number		Level
CLO1	Demonstrate the basic concepts of statistics	K1
CLO2	Identify the methods for different measures of central tendency, dispersion	K2
CLO3	Indicate the strength and direction of a linear relationship between two variables, regression and time series.	K3
CLO4	Demonstrate advanced understanding of the concepts of time series	K4

Mapping with Programme Learning Outcomes

CLO s/PLO s	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	М	S	S	S
CLO2	S	S	М	S	S
CLO3	S	S	S	М	S
CLO4	S	S	S	S	М
CLO5	S	М	S	S	S

17 hrs

19 hrs

16 hrs

17 hrs

B.Sc CS(AI)

STATISTICS FOR COMPUTER SCIENCE I

UNIT I

Introduction-Meaning and objectives of classification-Types of classification-Formation of a discrete and continuous frequency distribution-Tabulation of data- Parts of table- General rules of tabulation- Types of tables. Diagrams and graphs. Introduction to statistical software (like Excel) and learning graphs and diagrams using Excel.

UNIT II

Measures of location or central tendency: Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness. Kurtosis.

UNIT III

Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic method - Karl Pearson's coefficient of correlation - Coefficient of correlation and probable error - Coefficient of determination - Properties of the coefficient of the correlation - Rank correlation coefficient -Features of Spearman's correlation coefficient, Regression analysis. 17 hrs

UNIT IV

Analysis of time Series -Introduction - Utility of time series - Components of time series - Preliminary adjustments before analyzing time series - Measurement of trend - Free hand graphic method - Method of semi averages - Moving average method - Measurement of seasonal variations - Method of simple averages only - Ratio-to-trend Method - Ratio-to moving average method - Link relative method.

UNIT V

Index Numbers: Introduction - Uses of index numbers - Classification of index numbers -Problems in construction of index numbers - Methods of constructing index numbers - Quantity of volume index numbers - Value index numbers - Tests of adequacy of index number formulae. Interpolation: Introduction - Significance of interpolation and extrapolation - Extrapolation -Assumptions of interpolation and extrapolation - Methods of interpolation - Binomial expansion methods - Newton's method - Lagrange's method.

Syllabus

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication			
1.	S P Gupta	Statistical Methods	Sultan Chand &Sons publishers	2004			
	Unit I: Volume I: Chapter: 1						
	Unit II: Volume I: Chapter: 2 Unit III:Volume I: Chapter10,11						
	Unit IV: V	olume I:Chapter 14					
	Unit-V : V	Volume I: Chapter 13					

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication			
1.	P.N.Arora SumeetArora, S.Arora	Comprehensive Statistical Methods	Sultan Chand & Sons	2008			
2.	David Lane,	Introduction to Statistics	David Lane	2003			
3.	Krishnan Vijaya	Statistics for Beginners	Atlantic Publishers & Distributors Pvt Ltd	2011			
4.	S.C Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Publications	2001			
Note							

Question paper setters to confine to the above text books only

MOOC learning

https://nptel.ac.in/courses/110/107/110107114/

Lecture 1: Introduction-Meaning and objectives of classification, Diagrams and graphs Lecture 2: Measures of location or central tendency

https://nptel.ac.in/courses/111/105/111105042/

Lecture 1: Regression analysis

https://www.youtube.com/watch?v= WM8vzYSQhs

Module 1: Lecture 39: Regression Analysis and Correlation

https://www.youtube.com/watch?v=zlZaOnBbpUg

(Lesson by Prof. Arunkanda, Department of Mechanical Engineering, IIT ,Delhi)

Lecture 35 - Analysis of Time Series

https://www.youtube.com/watch?v=JT9o8b43Gk0

Index numbers

https://nptel.ac.in/courses/102106051/

Pedagogy

Chalk and talk, ppt, Group discussion, Seminar, Quiz, Assignment

Course Designers

1. Dr.C.R.Parvathy, Associate Professor

QUESTION PAPER PATTERN (PG)

CIA Question Paper Pattern: 2 x 25 = 50 Marks

One question from each unit with each question comprising of

- Two questions with a weightage of 2 marks (no choice)
- Two questions with a weightage of 6 marks (no choice)
- One question with weightage of 9 marks (Internal Choice at the same CLO level)

ESE Question Paper Pattern: 5 x 20 = 100 Marks

One question from each unit with each question comprising of

- One question with a weightage of 2 marks (no choice)
- One question with a weightage of 6 marks (Internal Choice at the same CLO level)
- One question with weightage of 12 marks (Internal Choice at the same CLO level)