

PSGR Krishnammal College for Women



Department of Mathematics (PG)

CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS

MASTER OF SCIENCE (M.Sc) MATHEMATICS 2021-2023 (BATCH)

MTH 1





PROGRAMME OUTCOMES – PG

After completion of the programme, the student will be able to

- **PO1:** Students acquire sound analytical and practical knowledge to formulate and solve challenging problems.
- **P02:** Students will be able to read and identify mathematical and computational methods in order to solve comprehensive problems.
- **PO3:** Students are well prepared to take jobs in schools and colleges as Mathematic Teachers and Professors, Software Industries, Research and Development Organizations.
- **PO4:** Students to purse higher studies in Mathematical and Computing Sciences and to clear Competitive exams like SET/ NET/ TET etc.
- **PO5:** Students to learn and apply Mathematics in real life situations aiming at service to the society.

PROGRAMME SPECIFIC OUTCOMES

The students at the time of graduation will

- **PSO1:** 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
- **PSO2:** Advanced mathematical topics provide opportunities to research students for communication and discussion.
- **PSO3:** Demonstrate the highest standard of ethics in research.
- **PSO4:** Provide scope for interaction with international researchers and developing collaborations.
- **PSO5:** Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.
- **PSO6:** Nurture problem solving skills, thinking, creativity through assignments, project work. Generate publications in reputed mathematical journals.

DEPARTMENT OF MATHEMATICS(PG)

CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION SYLLABUS & SCHEME OF EXAMINATION MASTER OF MATHEMATICS (M.Sc Mathematics) 2021-2023 BATCH

Subject	Title of the paper	Туре	Hours	Contact	Tutorial	Duration	Exan	nination	Marks	Credits
Code			per Weelt	Hrs	Hrs	of Exam	CA	ESE	Total	
SEMESTER I			week							
MTH2101	Algebra	Core	6	86	4	3 hrs	50	50	100	4
MTH2102	Real Analysis	Core	6	86	4	3 hrs	50	50	100	4
MTH2103	Ordinary Differential Equations	Core	6	86	4	3 hrs	50	50	100	4
MTH2104	Mathematical Statistics	Core	6	86	4	3 hrs	50	50	100	4
MTH21E1	Elective I: Financial	Elective	6	86	4	3 hrs	50	50	100	4
	Mathematics (OR)									
MTH21E2	Elective II: Graph Theory									
SEMESTER II	1		i		1	1	i			
MTH2105	Number Theory	Core	5	71	4	3 hrs	50	50	100	4
MTH2106	Lebesgue Measure Theory	Core	5	71	4	3 hrs	50	50	100	4
MTH2107	Partial Differential Equations	Core	5	71	4	3 hrs	50	50	100	4
MTH2108	Mechanics	Core	6	86	4	3 hrs	50	50	100	5
MTH21E3	Elective III: Control theory	Elective	4	56	4	3 hrs	50	50	100	3
MTH21E4	(OR) Elective IV: Stochastic									
MCM18A3	IDC Einancial and	Inter	5	75		3 hrs		100	100	2
WICWITOAS	Management Accounting	disciplinary	5	15	-	51115	-	100	100	5
SEMESTER II	SEMESTER III									
MTH2109	Complex Analysis	Core	6	86	4	3 hrs	50	50	100	5
MTH2110	Topology	Core	6	86	4	3 hrs	50	50	100	5
MTH2111	Design of Counts grouphy	Core	6	00	1	2 hm	50	50	100	5
MTH2111		Core	0	80	4	3 ms	50	50	100	5
MTH2112	Fluid Dynamics	Core	6	86	4	3 hrs	50	50	100	3
MTH19S1	Research Methodology	Special paper	2	30	-	3 hrs	-	100	100	2
MTH21E5	Elective V: Mathematical	Elective	4	56	4	3 hrs	50	50	100	3
MTH21E6	Modelling (OR)									
GEN JEGTED I	Elective VI: Tensor Analysis									
SEMESTERI	/									
MTH2113	Functional Analysis	Core	6	86	4	3 hrs	50	50	100	5
MTH2114	Mathematical Methods	Core	6	86	4	3 hrs	50	50	100	5
MTH2115	Mathematical Programming	Core	6	86	4	3hrs	50	50	100	4
MTH21PROJ	Project	Core	6	90	-	3 hrs	50	50	100	4
MTH21E7	Elective VII: Formal	Elective	6	86	4	3 hrs	50	50	100	4
	Languages and Automata									
	Theory									
MTH21E8	(OR)									
	Elective VIII: Differential									
	Geometry									
MTH1622	ALC- Advanced Computing	ALC	-	-	_	3 hrs	25	75	100	5
1411111022	Techniques			_	_	5 113	25	15	100	5
MTH1623	(OR)	ALC	-	-	-	3 hrs	25	75	100	5
	ALC – Introduction to									
	Algorithms									

- ➤ 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 Outcomes

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

СО	CO Statement				
Number		Level			
CO1	Demonstrate competence with the basic ideas of algebra including the concepts of direct products, finitely generated abelian groups	K2			
CO2	Demonstrate knowledge of the structures of fields ,extension fields and finite fields	К3			
CO3	Appreciate the significance Sylow's theorem and Galois theory	K4			
CO4	Compose clear and accurate proofs using the concepts of Algebra	K5			
CO5	Demonstrate competence with the basic ideas of linear Algebra including the concepts of modules and linear transformations	K6			

Mapping with Programme Outcomes

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

Unit I

CORE I - SEMESTER I – ALGEBRA (MTH2101) (17 hrs)

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

S. No Title of the book Year of Author **Publishers** Publication 2nd edition, John Wiley & I.N. Topics in Algebra 2016 Herstein Sons 1. Unit I : Chapter 2 – 2.11,2.12,2.13,2.14 Unit II : Chapter 4- 4.1,4.2,4.3,4.4,4.5 Unit III: Chapter 5 – 5.1,5.3,5.5,5.6,5.7 Chapter 7-7.1 Unit IV: Chapter 6-6.1,6.2,6.3,6.4,6.5 Unit V : Chapter 6 – 6.6,6.7,6.8,6.9,6.10,6.11

Unit III

Unit IV

Unit V

Text book

Unit II

(18 hrs)

(17 hrs)

(17 hrs)

(17 hrs)

References

S.	Author	Title of the book	Publishers	Year of
No				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	Linear Algebra	Hindustan book	2000
	&Bhimsankaran			
4.	Serge Lang	Linear Algebra	Addison-Wesley	2004
5	S. Vumaragan	Lincor Alashra	Drantica Hall	2000
5.	S. Kullalesali	Linear Algeora	Fleitice Hall	2000
6.	T. W. Hungerford	Algebra	Springer	2000

Pedagogy

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

Course Designers

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

2. Mrs. R. Meenambigai, Assistant Professor

- > 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 Outcomes

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

СО	CO Statement	Knowledge
Number		Level
CO1	Describe fundamental properties of the real numbers that lead to the formal development of real analysis	К2
CO2	Comprehend rigorous arguments developing the theory underpinning real analysis	К3
CO3	Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration	K4
CO4	Construct various mathematical proofs of basic results in real analysis	K5
CO5	Appreciate 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	K6

Mapping with Programme Outcomes

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

CORE II – SEMESTER I - REAL ANALYSIS (MTH2102)

Unit I (18Hrs) 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

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

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

(18 Hrs)

(16Hrs)

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 – Chapter 9 – Sections: 9.26 – 9.42						

Reference Books

S. No	Author	Title of the	Publishers	Year of
		book		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. Mrs.R.Sakthikala, Assistant Professor
- 2. Mrs.S.Aiswarya, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	ORDINARY DIFFERENTIAL	THEORY	86	4	-	4
MTH2103	EQUATIONS			-		-

- > 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 Outcomes

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

СО	CO Statement	Knowledge
Number		Level
CO1.	Solve a variety of first order differential equations selecting from a variety of techniques	K2
CO2.	Solve a variety of second order differential equations, selecting from several techniques	K2
CO3.	Give series solutions (and approximations) for second order linear differential equations,	K3
	both at ordinary points and at regular singular points	
CO4.	Understand 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).	К5
CO5.	Construct and apply symbolic and graphical representations of functions	K6

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

Mapping with Programme Outcomes

MTH 11

Syllabus

CORE III – SEMESTER I - ORDINARY DIFFERENTIAL EQUATIONS (MTH2103)

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

Unit V

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.

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.

Text book

S. No	Author	Title of the book	Publishers	Year of Publicatio n
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 - Section 5.3 - 5.8		
	Unit V: Chapter	6 - Section 6.1 - 6.6		

(16 hrs)

(16 hrs)

(17 hrs)

(18 hrs)

(19 hrs)

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

Pedagogy

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

Course Designers

1. Mrs.R.Panneerselvi, Assistant Professor

2. Dr.C.R.Parvathy, Assistant Professor

COURSE NUMBER MTH2104

COURSE NAME MATHEMATICAL STATISTICS

CATEGORY	L	Т	Р	CREDIT
THEORY	86	4	-	4

Preamble

- > 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 Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the basic concepts of statistics, probability and random variables	K ₂
CO2	Apply the concepts in finding the moments of the distributions	K ₃
CO3	Identify the type of the distribution	K4
CO4	Understand the basics of sampling distribution theory	K5
CO5	Emphasis on estimating a good estimate using unbiased, sufficient, efficient estimates	K ₆

Mapping with Programme Outcomes

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

CORE IV – SEMESTER I - MATHEMATICAL STATISTICS (MTH2104)

(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 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 : Chapter 6 : 6.1-6.4, 6.6-6.9,							
	Unit II: Chapter 7: 7.1-7.5.							
	Unit III: Chapter 8 : 8.1-8.7							
	Unit IV: Chapter 9 : 9.1-9.6 , Chapter 12:12.1-12.4,12.7							
	Unit V: Ch	apter 13: 13.1-13.8						

References

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.C.R.Parvathy, Assistant Professor
- 2. Mrs.M. Mohanapriya, Assistant Professor

COURSE NUMBER	COURSE NAME FINANICAL MATHEMATICS	CATEGORY	L	Т	Р	CREDIT
MTH21E1		THEORY	86	4	-	4

- > 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 Outcomes

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

СО	CO Statement	Knowledge
Number		Level
CO1	Apply advanced knowledge in probability, statistics, stochastic calcul	K)
	us and numerical methods for financial applications.	K2
CO2	Demonstrate a broad knowledge of the financial securities as well as	K3
	practical aspects of risk management.	KJ
CO3	Construct quantitative models for derivative pricing, quantitative trad	K A
	ing strategies, risk management, and scenario simulations.	Κ4
CO4	Communicate effectively with potential clients and peers	K5
CO5	Use statistical techniques and methods in data analysis; understand the advantages and limitations of different methods.	K5

Mapping with Programme Outcomes

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

ELECTIVE I – SEMESTER I - FINANICAL MATHEMATICS (MTH21E1) (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.

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 continuous models.

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

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.

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.

Publishers

Publication Alison A Course in Financial University of Etheridge Calculus Oxford 1 Unit I Chapter I: 1.1 to 1.6 Chapter II: 2.1 to 2.6 Unit II 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

Title of the book

(17 Hrs)

(17 Hrs)

(19 Hrs)

(17 Hrs)

Year of

Unit II

Unit III

Unit IV

Unit I

Unit V

Text Book

Author

S. No

Referen	Reference Book							
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. Mrs.K.Sharmilaa, Assistant Professor
- 2. Mrs.R.Panneerselvi, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	CRAPH THFORV	THEORY	86	4	-	4
MTH21E2	OKAI II THEORI		00	-		-

- > 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 Outcomes

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

СО	CO Statement	Knowledge
Number		Level
CO1	Understanding of some network and colouring in Graph theory.	K2
CO2	Apply the understanding and used to model the atomic variable .	K3
CO3	Apply the concepts of connectivity, Blocks and Hamilton cycles in the real life.	K4
CO4	Demonstrate the concept and familiar with the concepts of colouring develop the reader to apply in day today life .	К5
CO5	Emphasis on some of the concepts in graph theory and the readers to apply in day today life.	K5

Mapping with Programme Outcomes

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

ELECTIVE II - SEMESTER I - GRAPH THEORY (MTH21E2)

Unit I

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.

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

Unit III

Unit II

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.

(18 hrs)

(18 hrs)

(16 hrs)

(18 hrs)

(16 hrs)

Text book

S. No	Author	Title of the book	Publishers	Year of		
				Publication		
1.	J.A. Bondy	Graph theory with	Elsevier Publishing	1976		
	and U.S.R.	applications	Co., Inc., New York			
	Murty					
	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 : Cha	apter 9, Sections 9.1 to 9.7 & Cha	apter 10, Sections 10.1 to	10.3		

References

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

Pedagogy

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

Course Designers

- 1. Mrs. S. Narmatha, Assistant Professor
- 2. Mrs. S. Lakshmi, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	QUANTITATIVE APTITUDE -	THEORY	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 Outcomes

СО	CO Statement	Knowledge
Number		Level
CO1.	Acquires the knowledge of equation, interest and simple concept of logic	K1
CO2.	Understand the basic principles of interest, sequence of problems.	K1
CO3.	Interpret and apply knowledge of mathematics through differential calculus and integration.	K2
CO4.	Identify, formulate and solve the problems.	K3
CO5.	Understand the concepts of limit and continuity.	К3

Mapping with Programme Outcomes

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

(18 Hrs)

(18 Hrs)

(17 Hrs)

(16 Hrs)

(17 Hrs)

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.

Text Book

S.	Author	Title of the book	Publishers	Year of
No				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. Ms.K.Kavitha, Assistant professor

2. Ms. J.Rejula Mercy, Assistant professor

CATEGORY	L	Т	Р	CREDIT
THEORY	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 Outcomes

Upon the successful completion of the course students will able to

CO Number	CO Statement	Knowledge Level
CO1.	Demonstrate factual knowledge including the mathematical notation and terminology of number theory	K2
CO2.	Construct mathematical proofs of statements and find counterexamples to false statements in Number Theory.	K3
CO3.	Apply theoretical knowledge to problems of computer security	K4
CO4.	Analyze the logic and methods behind the major proofs in number theory.	K5
CO5.	Explore some current research problems in number theory	K5

Mapping with Programme Outcomes

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

CORE V – SEMESTER II - NUMBER THEORY (MTH2105)

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**

(14 Hrs) 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

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication		
1.	Erickson and	Introduction to	Chapman &	2009		
	Vazzana	Number Theory	Hall/CRC			
	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					

(13 Hrs)

(14 Hrs)

(16 Hrs)

(14 Hrs)

Reference Books

S. No	Author	Title of the	Publishers	Year of
		book		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.C.R. Parvathy, Assistant

Professor

2.Mrs.K. Kavitha, Assistant

Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	I EDESCHE MEASHDE THEODV	THEORY	71	4	-	4
MTH2106	LEDESGUE MEASURE THEORY	miloni	/1	•		•

- > 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 Outcomes

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

СО	CO Statement	Knowledge
Number		Level
CO1	Describes 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.	
CO2	Derives the concepts of Borel sets, measurable functions, differentiation of	V2
	monotone functions	K3
CO3	Analyse about the little wood's theorem, integral of a non-negative function,	V A
	functions of bounded variation	Λ4
CO4	Construct a clear idea about convergence in measure, differentiation of an integral,	V5
	absolute continuity and convex functions	KJ
CO5	Apply the theory of the course to solve a variety of problems at an appropriate level	VA
	of difficulty	N0

Mapping with Programme Outcomes

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

CORE VI – SEMESTER II - LEBESGUE MEASURE THEORY (MTH2106)

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)

(14 Hrs)

(14 Hrs)

(14Hrs

(14Hrs)

(15Hrs)

Text	Book
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S. No	Author	Title of the book	Publishers	Year of Publication			
1.	H.L.Royden	Real Analysis	PHI Learning Private limited	2009			
	UNIT: I – Chapter 2– Sections: 1-7						
	UNIT: II – Chapter 3 – Sections: 1-3, 5, 6						
	UNIT: III – Cha	pter 4– Sections: 1-4					
	UNIT: IV – Cha UNIT: V – Chap	pter 5– Sections: 1-5 pter 6 – Sections: 1-4					

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 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.R. Sakthikala, Assistant Professor

2. Mrs.S. Aiswarya, Assistant Professor

- > 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 Outcomes

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

Mapping with Course Outcomes

CO	CO Statement	Knowledge
Number		Level
CO1	Enumerate the basic concepts of first and second order partial differential equation of and different methods of solving pde's	K2
CO2	Classify PDEs, apply analytical methods, and physically interpret the solutions.	К3
CO3	Formulate, analyse and validate mathematical models of practical problems related to other fields.	K4
CO4	Investigate boundary values problems and point out its significance	K5
CO5	Use knowledge of partial differential equations for modelling the general structure of solutions and using analytic methods for solutions.	K6

Mapping with Programme Outcomes

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

Unit I

CORE VII – SEMESTER II - PARTIAL DIFFERENTIAL EQUATIONS (MTH2107) (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 onedimensional 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.	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, Chap	pter 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	TataMcGrawHillEducationPrivateLimited	2011

Pedagogy :

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

Course Designers

- 1. Mrs. S. Aiswarya, Assistant Professor
- 2. Dr. C. R. Parvathy, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER	MECHANICS	THEORY	86	4	-	5
MTH2108	MECHANICS					

- 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 Outcomes

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

СО	CO Statement	
Number		Level
CO1	Demonstrate the knowledge of core principles in mechanics	K2
CO2	Interpret complex and difficult problems of classical dynamics in a systematic way	К3
CO3	Apply the variation principle for real physical situations	K4
CO4	Identify the existing symmetries and the corresponding integrals of motion and analyze the qualitative nature of dynamics	К5
CO5	Explore 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 Outcomes

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

CORE VIII – SEMESTER II - MECHANICS (MTH2108)

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.

(17 hrs)

(17 hrs)

(18 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 2: Sections 2.1-2.3.				
	UNIT III : Chapter 4: Sections: 4.1-4.3.				
	UNIT IV : Chapter 5				
	UNIT V : Chapt	ter 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

- 1. Mrs. S.Aiswarya, Assistant Professor
- 2. Mrs. R.Meenambigai, Assistant Professor
- 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 Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Describe the basic concepts and properties of differential equations, fundamental concepts of control system	K2
CO2	Understand about concept of observable and controllable system.	К3
CO3	Ability to analyze and design a new control system.	K4
CO4	Analyze the system stability, equilibrium points, linear system stability	K5
CO5	Apply optimal control to statement of the optimal control problems and interpret the problems	К6

Mapping with Programme Outcomes

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

Syllabus

ELECTIVE III – SEMESTER II - CONTROL THEORY (MTH21E3)

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.

(12 Hrs)

(11 Hrs)

(11 Hrs)

(11 Hrs)

(11 Hrs)

Text Book

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

Reference Books

S.	Author	Title of the book	Publishers	Year of
No				Publication
1			· ·	2000
1.	Mike	A primer on the calculus	American	2009
	Mesterton	of variations and	Mathematical	
		optimal control	Society	
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	CBS Publishers	2015
		of Control Systems :		
		With Essential Theory		

Pedagogy

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

Course Designers

- 1. Mrs. M.Mohanapriya, Assistant Professor
- 2. Dr. C.R.Parvathy, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
NUMBER MTH21E4	STOCHASTIC PROCESSES	THEORY	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 Outcomes

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

СО	CO Statement	Knowledge
Number		Level
CO1	Demonstrate the basic concepts of Stochastic process, Markov chains,	K ₂
CO2	Apply the concepts in	K ₃
CO3	Identify the type of the distribution	K4
CO4	Understand the basics of sampling distribution theory	K5
CO5	Emphasis on estimating a good estimate using unbiased, sufficient, efficient estimates	K ₆

Mapping with Programme Outcomes

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

Syllabus

UNIT I

ELECTIVE IV – SEMESTER II - STOCHASTIC PROCESSES (MTH21E4) (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**

Text b	Text book					
S. No	Author	Title of the book	Publishers	Year of Publication		

(11 Hrs)

(11 Hrs)

(11 Hrs)

(11 Hrs)

1	Samuel Karlin	A First Course in	Academic	Press,	
	and Howard M.	Stochastic Processes	New york,	Second	
	Taylor		edition.		
	Unit I : Chapter : I	1,2			
	Unit II : Chapter :	3,4			
	Unit III: Chapter :	5,7			
	Unit IV: Chapter :	8			
	Unit V: Chapter:	9			

References

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 Designers

- 1. Dr. C.R. Parvathy, Assistant Professor
- 2. Mrs. M. Mohanapriya, Assistant Professor

IDC SYLLABUS

- M.Com Quantitative Techniques for Commerce (MTH18A3)
- M.Sc (CS) Statistical Techniques in Practice (MTH19A5)

M.Sc Physics- Tensor & Numerical Methods (MTH16A4)

- > 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 Outcomes

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

CO Number	CO Statement	Knowledg e Level
CO1	Identify the source of quantifiable problems, recognize and solve. Understand and apply basic concepts and describe mathematical relations and functions.	К2
CO2	Apply the concepts of Quantitative Techniques to solve the problems.	K3
CO3	Determine the correct statistical method and optimization techniques to analyze and evaluate the problems.	K4
CO4	Formulate and interpret the problems by available techniques.	K5
CO5	Evaluate problems by using statistical method and optimization techniques. Apply quantitative techniques to commercial problem and analyze the results.	K6

Mapping with Programme Outcomes

COs/PO	PO1	PO2	PO3	PO4	PO5
S					
CO1	М	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	М	S	S
CO4	S	S	S	S	S
CO5	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

(14 Hrs)

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

(12Hrs)

(11Hrs)

(15Hrs)

(15Hrs)

Text books

S. No	Author	Title of the book	Publishers	Year of		
			1 0011011010	Publication		
	Man Mohan	Operations Research	Sultan Chand	2005		
1.	PK Gunta	1	& Sons			
	Kanti					
	Swomp					
	Unit 1: Chapter 1 s	vection 1.1 1.6 Chapter 2 section	21 22			
	Unit 4. Chapter 1 section $1.1 - 1.0$, Chapter 2 section $2.1 - 2.2$					
	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) section 20.1 – 20.8 Model I & II	Ι			
	Chapter 11	section 11.1 - 11.6(exclude 11.5)			
	Chapter 21	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		I		
	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	2010
		Economists	International	
			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. Mrs.J.Rejula Mercy, Assistant Professor
- 2. Mrs.S.Aiswarya, Assistant Professor

COURSE	COURSE NAME	Category	L	Т	Р	Credit
NUMBER MTH19A5	STATISTICAL TECHNIQUES IN PRACTICE	THEORY	60	-	-	4

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

Course Outcomes

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

CO	CO Statement	Knowledge
Number		Level
CO1	Learn the basics of Probability	K2
CO2	Understand the properties of Statistical Distributions	К3
CO3	Use basic combinatorial techniques to calculate probabilities,	K4
CO4	Learn to use Statistical tests and sampling theory.	K5
CO5	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 ProgrammeOutcomes

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

SEMESTER II IDC – M.Sc(CS) & M.Sc(IT)

STATISTICAL TECHNIQUES IN PRACTICE(MTH19A5)

Probability-addition and multiplication theorems- problems - conditional probabilitymathematical expectations- Bayer's theorem and random variable and probability distribution.

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

UNIT III

UNIT I

UNIT II

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

UNIT IV

Sampling- statistical Quality control- control charts- single- double sampling plans-acceptance- sampling theory.

UNIT V

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

(11hrs)

(11hrs)

(12 hrs)

(11hrs)

(11hrs)

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 –	Pg 752-799			
	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	- Pg : 1052- 1091			
	Unit V : Chapter 9	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 Statistics	Jai publishers	2017

Course Designers

- 1. Mrs.K.Sharmilaa, Assistant Professor
- 2. Mrs.C.R.Parvathy, Assistant Professor

- > To present students the elements of tensoranalysis.
- > To introduce different methods for solving problemsnumerically.
- To enable the students to find solution to practical and real world problem using numerical methods.

Mapping with Course Outcomes

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

CO Number	CO Statement	Knowledg e Level
CO1	Describe the basic concepts of tensor analysis and its application in science and engineering.	K2
CO2	Demonstrate the theoretical and practical aspects of numerical methods.	K3
CO3	Implement numerical methods for a variety of multidisciplinary applications.	K4
CO4	Understand the different numerical methods for interpolation, differentiation, integration and solving set of ordinary differential equations	K5
CO5	Implement numerical methods in various physical problems.	K6

Mapping with Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4
CO1.	S	М	М	М
CO2.	S	S	S	М
CO3.	S	S	S	М
CO4.	S	S	S	S
CO5.	S	S	М	S

SEMESTER II – M.Sc (Physics) – IDC TENSOR & NUMERICAL METHODS (MTH16A4)

Unit I

Tensor Analysis Definition of Tensors - Contravariant - covariant and mixed tensors - addition and subtraction of Tensors - Summation convention - Symmetry and Anisymmetry Tensor - Contraction and direct product - Quotientlaw.

Unit II

Numerical solutions of Algebraic and Transcendental Equation: Method of False position (RegulaFalsi method) -Newton -Raphson Method -Solution of Simultaneous Linear Algebraic Equations: Gauss Elimination Method -Interpolation with equal intervals: Gregory -Newton's forward interpolation formula for Equal Intervals - Gregory -Newton's Backward interpolation formula for Equal Intervals -Interpolation with unequal Intervals: Lagrange's Interpolation Formula for unequal Intervals - Method of Least Squares: Fitting a straight line - Fitting a Second Degree Parabola.

Unit III

Numerical Differentiation: Values of the derivatives of y - based on Newton's Forward Interpolation formula - Values of the derivatives of y - based on Newton's Backward Interpolation formula.

Unit IV

Numerical integration: Newton -Cote's Quadrature Formula - Trapezoidal rule - composite trapezoidal rule - Simpson's one - third rule - composites Simpson's one - third rule - Simpson's three - eighths rule - composite Simpson's three eights rule.

Unit V

Numerical solutions of ordinary differential equations: Euler's method - Runge -Kutta formulas of first and second order - Runge - Kutta formulas of the third and fourth order - RungeKutta formula for the solution of second order differentialequation.

(8Hrs)

(9Hrs)

(8 Hrs)

(8 Hrs)

(8 Hrs)

Text Book

~	Author	Title of the book	Publishers	Year of
S. No				Publicatio
				n
1.	A.W.Joshi	Matrices and Tensors in	New Age	2010
		Physics Unit I	International	
			Publishers,	
		Part II – Chapter - 15,16,17	Revised Edition	
2.	M.K.Venkatarama	Numerical methods in science	National	1999
	n	and engineering	Publisher	
		Unit II,III,IV,V Unit:II	Company	
		Chapter I –		
		Sec:1.6,1.7,1.8 Chapter III		
		– Sec: 4,5,6 ChapterIV –		
		Sec: 1,2,3 Chapter VI -		
		VIII Social		
		VIII – Sec.4		
		UNIT:III		
		Chapter:IX – Sec:1,2,3		
		UNIT:IV		
		Chapter IX –		
		Sec:7,8,10,11 UNIT:V		
		Chapter XI- Sec: 10,13,14,15,16		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publicatio
1.	V. Rajaraman	Computer Oriented Numerical Methods	Prentice–Hall of India	1993
2.	P.Kandasamy	Numerical methods	S.Chand and company limited, NewDelhi	2003
3.	S.C. Chapra and P.C.Raymond	Numerical methods for Engineers	Tata McGrawHill, NewDelhi	2000
4.	Shaheer Khan	Tensor Analysis and Its Applications	Partridge India	2015

Pedagogy

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

Course Designers

1. Mrs.S.Aiswarya, Assitant Professor 2. Mrs.C.R.Parvathy, Assistant Professor

CATEGORY	L	Т	Р	CREDIT
THEORY	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 Outcomes

On the successful completion of the course students will be

CO Number	CO Statement	Knowledge Level
CO1	Acquires the basic concepts of data description and its representation	K1
CO2	Understand the basic principles of sampling theory	K1
CO3	Understand the role as well as the distinction between discrete and continuous data	К2
CO4	Apply the skills of data analysis and emphasis on understanding variation, collecting information in the face of uncertainty, checking distributional assumptions	K2
CO5	Apply probability as a tool for anticipating the distribution of data and using appropriate method to draw conclusions.	К3

Mapping with Programme Outcomes

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

Syllabus

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

Unit I

(18 Hrs)

Statistical description of data: Textual - Tabular - Diagrammatic representation of Data - frequency distributions - Graphical representation of data - Frequency Polygon - Ogive. Unit-II (18 Hrs)

Measures of Central tendency and Dispersion:Introduction - mean - median – partition values - mode - Geometric mean - harmonic mean - standard deviation - quartile deviation - correlation - regression.

Unit-III

(17 Hrs)

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

(17 Hrs)

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

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. Ms.K.Kavitha, Assistant professor
- 2. Ms. J.Rejula Mercy, Assistant professor

SEMESTER II

CATEGORY	L	Т	Р	CREDIT
Theory	86	4	-	5

Preamble

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	K3
CLO5	Construct simple price, quantity, and value indexes.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	S	М	S	S	S	S
CLO2	S	S	М	S	S	S
CLO3	S	S	S	М	S	S
CLO4	S	S	S	S	М	S
CLO5	S	М	S	S	S	S

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. 17 hrs

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.

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.

Text Book

Author	Title of the book	Publishers	Year of Publication		
S P Gupta	Statistical Methods	Sultan Chand &Sons publishers	2004		
Unit I: Vol	lume 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	olume I: Chapter 13				
	S P Gupta Unit I: Vol Unit II: Vo Unit III: Vo Unit IV: V Unit IV: V Unit-V : V	AuthorThe of the bookS P GuptaStatistical MethodsUnit I: Volume I: Chapter: 1Unit II: Volume I: Chapter: 2Unit III: Volume I: Chapter: 10,11Unit IV: Volume I: Chapter 14,11Unit IV: Volume I: Chapter 14Unit-V : Volume I: Chapter 13	AuthorInte of the bookPublishersS P GuptaStatistical MethodsSultan Chand &Sons publishersUnit I: Volume I: Chapter: 1Unit II: Volume I: Chapter: 2Unit III: Volume I: Chapter: 10,11Unit IV: Volume I: Chapter 14Unit-V : Volume I: Chapter 13		

16 hrs

19 hrs

17 hrs

17 hrs

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

Question paper setters to confine to the above text books only

MOOC learning

<u>https://nptel.ac.in/courses/110/107/110107114/</u> Lecture 1:Introduction-Meaning and objectives of classification, Diagrams and graphs Lecture 2: Measures of location or central tendency <u>https://nptel.ac.in/courses/111/105/111105042/</u> Lecture 1: Regression analysis <u>https://www.youtube.com/watch?v=_WM8vzYSOhs</u> Module 1: Lecture 39: Regression Analysis and Correlation <u>https://www.youtube.com/watch?v=zIZaOnBbpUg</u>

(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, Department of Mathematics
- 2. Mrs.R.Meenambigai, Assistant Professor, Department of Mathematics

MTH 58

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER	COMPLEY ANALVSIS	CORE	86	4	-	5
MTH2109	COMILEA ANAL ISIS					-

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

Course Learning Outcomes

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

CLO	CLO	Knowledge
Number	Statement	Level
CLO1	Understand the fundamental properties of the complex numbers that lead to the development of complex analysis	K2
CLO2	Apply the line integrals, curve integrals, singularities and determine the values of integrals using residues.	К3
CLO3	Analysis about limits and to know how they are used in series and problems	K4
CLO4	Evaluate the functions of complex variable in terms of continuity, differentiability and analyticity. Apply Cauchy-Riemann equations and harmonic functions to solve problems	К5
CLO5	Create a rigorous arguments developing the theory underpinning complex analysis	К5

Mapping with Programme Learning Outcomes

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

CORE IX - SEMESTER III - COMPLEX ANALYSIS (MTH2109)

Unit I

Introduction to the concept of **analytic function:** Limits and continuity - Analytic functions- Polynomials - Rational functions - **Conformality:** Arcs and closed Curves - **Analytic functions in regions - Conformal Mapping** - Length and Area - Linear Transformations: The Linear group - The Cross-ratio - Elementary Riemann Surfaces.

Unit II

Complex integration: Line integrals **Rectifiable Arcs** - Line Integrals as Functions of Arcs- **Cauchy's theorem for a rectangle** - Cauchy's theorem in a disk - Cauchy's integral formula: The index of a point with respect to a closed curve - The integer formula - Higher derivatives - **Removable singularities** - Taylor's Theorem - **Zeros and Poles** - The local mapping - The Maximum Principle - chains and cycles.

Unit III

The Calculus of Residues: **The Residue theorem** - The Argument principle -Evaluation of definite integrals - Harmonic functions: The Definitions and basic Properties - **Mean value property** - Poisson's Formula.

Unit IV

Series and Product Developments: **Weierstrass theorem -** The Taylor Series - The Laurent Series - Partial fractions and Factorization: Partial Fractions - Infinite Products - **Canonical Products.**

Unit V

The Riemann Mapping Theorem - Statement and Proof- Boundary Behavior -Use of the reflection principle - Analytic arcs - **Conformal mapping of Polygons:** The Behavior at an angle - **the Schwartz - Christoffel Formula - Mapping on a rectangle.**

(16 Hrs)

(17 Hrs)

(17 Hrs)

(17 Hrs)

(19 Hrs)

TextBook

S. No	Author	Title of the book	Publishers	Year of		
				Publication		
1.	L.V. Ahlfors	Complex Analysis	McGraw Hill, NewYork	2013		
	Unit I : Chapter -	- 2 Sections 1.1-1.4				
	Chapter - 3 Sections 2.1-2.4- 3.1-3.2 and 3.4					
	Unit II : Chapter - 4 Sections 1.1-1.5, 2.1-2.3, 3.1-3.4 and 4.1					
	Unit III: Chapte	r - 4 Sections 5.1-5.3,6.1-6.3				
	Unit IV: Chapte	r - 5 Sections 1.1-1.3,2.1-2.3				
	Unit V : Chapte	er - 6 Sections 1.1-1.4,2.1-2.3				

Reference Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1.	S. Ponnusamy	Foundations of Complex Analysis	Narosa Publisher	2003
2.	A.R.Vasistha and Etal	Complex Analysis	Krishna prakashan media pvt ltd	2008
3.	A.F.Beardon	Complex Analysis	John Wiley and Sons	1979

Pedagogy

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

Reference for E – Content

S.No	Unit	Торіс	Link
1	1	Analytic Function	https://www.youtube.com/watch?v=P51wt Dp7GjA
2	1	Conformality: Arcs and closed Curves - Analytic functions in regions - Conformal Mapping	https://www.youtube.com/watch?v=RT3Y h_jxjYo
3	2	Rectifiable Arcs	https://www.youtube.com/watch?v=XcDIj <u>Ret5hw</u>
4	2	Cauchy's theorem for a rectangle	https://www.youtube.com/watch?v=AruIh F83CIY
5	2	Removable singularities	https://www.youtube.com/watch?v=rbE6E uQLZbY
6	2	Zeros and Poles	https://www.youtube.com/watch?v=UhZ5 UjR5NPE
7	3	The Residue theorem	https://www.youtube.com/watch?v=eW0A rgJ3Isk
8	3	-Mean value property	https://www.youtube.com/watch?v=oASPjt mFANw
9	4	Weierstrass theorem -	https://www.youtube.com/watch?v=d3TCJ jIH5Jo

10	4	Canonical Products.	https://www.youtube.com/watch?v=aybXL m5hVao
11	5	The Riemann Mapping Theorem - Statement and Proof-	https://www.youtube.com/watch?v=EJ5df <u>UIYdFw</u>
12	5	Conformal mapping of Polygons:	https://www.youtube.com/watch?v=DGQI S3jhLlw
13	5	the Schwartz - Christoffel Formula - Mapping on a rectangle.	https://www.youtube.com/watch?v=VqpF EgKD6c8

Course Designer

Dr. R. Sasirekha ,Assistant Professor

COURSE NUMBER	COURSE NAME	CATEGORY	L	Т	Р	CREDIT
MTH2110	TOPOLOGY	CORE	86	4	-	4

- > Students will learn the fundamental concepts of point-set topology.
- Introduce students to the concepts of open and closed sets abstractly, not necessarily only on the real line approach.
- Provide the awareness of tools to students to carrying out advanced research work in pure mathematics

Course Learning Outcomes

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concept of topological spaces and continuous functions, concept of product topology and quotient topology	К2
CLO2	Apply the concepts of distance between two sets, connectedness, denseness, compactness and separation axioms.	К3
CLO3	Analyze the concepts to read and write theorem proofs in topology	K4
CLO4	Evaluate that a given point in a topological space is either a limit point of not for a given subset of a topological space.	K5
CLO5	Create theorem proofs to do variety of examples and counter examples in topology	K5

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

Mapping with Programme Learning Outcomes

CLOs\PLO	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	М	S
CLO2	S	S	S	S	S
CLO3	S	S	М	S	М
CLO4	S	М	S	S	М
CLO5	S	S	М	S	S

Syllabus

CORE X – SEMESTER III TOPOLOGY (MTH2110)

(18 Hrs)

Topological Spaces - Basis for a Topology - The Order Topology - Closed Sets and Limit Points

- Continuous Functions - Product Topology - Metric Topology.

Connectedness and Compactness: Connected Spaces - Connected sets in R -Components and Path Components - Local Connectedness - Compact Spaces - Limit Point Compactness - Local Compactness.

Countability and Separation Axioms: Countability Axioms - Separation Axioms - Urysohn's Lemma - Urysohn Metrization Theorem.

Unit IV (17 Hrs)

The Tychonoff Theorem - Completely Regular spaces - The Stone-Cech Compactification.

Complete Metric Spaces - Compactness in Metric Spaces - Point-wise and Compact Convergences - Ascoli's Theorem - Baire spaces.

Unit I

Unit II

Unit III

Unit V

- Conti

(19 Hrs)

(17 Hrs)

(15 Hrs)

S. No	Author	Title of the book	Publishers	Year of Publication
1.	James	Topology A First Course	Prentice Hall of	2000
	R.Munkres		India Pvt.	
			Ltd,New Delhi	
	Unit I : Chapte	r = 2 - Sections = 12 - 15, 17 - 20		
	Unit II : Chapte	er 3 -Sections 23 -29		
	Unit III : Chapte	er 4 -Sections 30,31,33,34		
	Unit IV : Chapte	er 5 -Sections 37,38		
	Unit V : Chapte	er 7 -Sections 43,45,46,47,48		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	George F. Simmons	Introduction to Topology and Modern Analysis	Tata McGraw -Hill Edition	2004
2.	J.Dugundji	Topology	Prentice Hall of India	1966
3.	J.L.Kelley	General Topology	Van Nostrand, Reinhold Co,New York	1995
4.	L.Steen and J.Seebach	Counterexamples in Topology	Holt -Rinehart and Winston, New York	1978

Pedagogy

Chalk & Talk, PPT, Group discussion, Seminar, Quiz, assignment.

S.No	UNIT	CONTENT	LINK
1	Ι	Closed Sets and Limit Points	https://www.youtube.com/watch?v=q6698vWK3ts
2	Ι	Continuous Functions	https://www.youtube.com/watch?v=ePUvjsmYzVU
3	II	Components and Path Components	https://www.youtube.com/watch?v=MFHVcqUe6Ic
4	II	Local Connectedness	https://www.youtube.com/watch?v=21cHwY0-aVA
5	II	Compact Spaces	https://www.youtube.com/watch?v=2z7ONxM139o
6	III	Urysohn's Lemma .	https://www.youtube.com/watch?v=Pk3UNunqbaw
7	III	Urysohn Metrization Theorem	https://www.youtube.com/watch?v=JUzssGzr-44 https://www.youtube.com/watch?v=FyYmppkacu0
8	IV	Stone-cech Compactification	https://www.youtube.com/watch?v=lcyiG8sxrsw
9	V	Ascoli's Theorem	https://www.youtube.com/watch?v=aNCJZt_WTxs
10	V	Baire spaces	https://www.youtube.com/watch?v=kt3-t1DauW8

Course Designers

Dr.K.Krishnaveni, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER MTH2111	BASICS OF CRYPTOGRAPHY	CORE	86	4	-	5
Preamble		1		1		

- Gain cyber security skills required for senior level careers by focusing on principles and best management techniques.
- Provides a deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
- To work for financial institutions and consultancies, and as security specialists within a wide range of companies and R&D organizations.

Course Learning Outcomes

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

CLO	CLO	Knowledg
No.	Statement	e level
CLO1	Understand the basic concept of Cryptography and Network	K_2
	Security, their mathematical models.	
CLO2	Apply the mathematical foundation required for various cryptographic Algorithms. Identify and classify computer and security threats	K3
C1O3	Aanalyze existing authentication protocols for two party communications.	K4
CLO4	Evaluate the issues and structure of Authentication Service and Electronic Mail Security, web security and IP security.	K5
CLO5	Create a security model to prevent, detect and recover from attacks.	K ₆

Mapping with Programme Learning Outcomes

	PLO	PLO2	PLO3	PLO4	PLO5
PLOS	l	0	0	0	G
CLOI	S	8	8	8	S
CLO2	S	S	S	М	S
CLO3	М	S	S	S	S
CLO4	S	S	S	S	S
CLO5	S	S	S	S	S

CORE XI – SEMESTER III - BASICS OF CRYPTOGRAPHY (MTH2111)

Unit I

Introduction to Information Security: Introduction, security, critical characteristics of information, NSTISSC security model, components of an information system, security components, Approaches to information security implementation. The system development life cycle, The Security System Development life cycle. The need for security: Business needs first, threats, attacks, secured software development.

Cryptography :Basic concepts of cryptography, Cryptograph tools. Authentication, Passwords, keys versus passwords, Attacking Systems via passwords, Password verification.

Unit II

Classical Encryption Techniques: Symmetric cipher model, substitution techniques, Transposition Techniques. Block Ciphers and the Data Encryption Standard: Block cipher principles, the data encryption standard, the strength of DES.

Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorem, Testing for primality, Miller-Rabin Algorithm. Chinese Remainder Theorem, Discrete Logarithms, Algorithms. (Except Problems)

Unit III

Public Key Cryptosystems : Principles of public-key cryptography, **public-key** cryptosystems, Applications for public-key cryptosystems, Requirements for public-key cryptography, public, key cryptanalysis, RSA Algorithm, Description of the Algorithm, Computational Aspects, Security of RSA.

Key Management: Diffie – Hellman Key Exchange – Algorithm, Key exchange protocols, Elliptic Curve Arithmetic, Elliptic Curve cryptography. (Except Problems)

Unit IV

Digital Signatures and Authentication Protocols : Requirements, Direct Digital Signature, Arbitrated Digital Signature, Authentication Protocols, Mutual Authentication, One Way Authentication, Digital Signature Standard, DSS Approach and Digital Signature Algorithm (Except Problem)

Unit V

Virus: Viruses and Related threats, Virus Countermeasure

Fire Walls: Firewalls, Types of Firewall, Design Principles of Firewall, Trusted Systems.

(18 hrs)

(19 hrs)

(15 hrs)

(15 hrs)

(19 hrs)

Text Books

S.No	Author	Title of the book	Publishers		Year of Publication	
1	Dr.Michael E.	Principles and Practices of	Course Tec	hnology	2009	
	Whitman	Information Security	Cengage Learning			
	Herbers					
	J.Mattord					
Unit I : Chapter 1 : Upto SSDLC & Chapter 2						
Chapter 8 : Upto Cryptographic Tools						
2	William	Cryptography and Network	Pearson	4 th Edition, 2006		
	Stallings	Security	Education			
Unit II : Chapter 2 : 2.1 – 2.3 Chapter 3 : 3.1 – 3.3 & Chapter 8 : 8.1 – 8.5						
Unit III : Chapter 9 : 9.1 – 9.2 Chapter 10 : 10.1 – 10.4						
Unit IV : Chapter 13 : 13.1 – 13.3						
Unit V : Chapter 19 : 19.1, 19.2 Chapter 20 : 20.1, 20.2						

Reference Books

S.No	Author	Title of the book	Publishers	Year of Publication	
1	Straub D.W	Information Security	Prentice Hall of India,	2009	
		information Security	New Delhi		
2 Pachgh	Dachahara V K	Cryptography and	PHI Learning Pvt Ltd,	2009	
	Pacingnare V.K.	Information Security	New Delhi		
3 H	Boris Ryabko, AndreyFionov	Basics of Contemporary	World Scientific		
		Cryptography for IT	Publishing Co.Re.Ltd,		
		practitioners, series on	Singapore	2005	
		coding theory and			
		cryptology – Vol I			

Pedagogy

Chalk & Talk, PPT, Group discussion, Seminar, Quiz, Assignment, Case Study, On-line Test

Reference for E – Content

S.No	UNIT	CONTENT	LINK
1	Ι	NSTISSC security model	https://youtu.be/zd0U1zNBYNk https://youtu.be/BrDETY0eyJ8
2	I	The Security System Development life cycle.	https://youtu.be/-UcjG5f_FEA
3	Ι	Attacking Systems	https://youtu.be/6gyf_FSx5O4
4.	II	data encryption standard	https://youtu.be/SaZGjQBItBc
5	П	Fermat's and Euler's Theorem	https://youtu.be/_Y1c4JViJDI https://youtu.be/sDrXeCs3ghQ
6	III	Public Key Distribution	https://youtu.be/1Nejm_xaPbI
7	III	Elliptic Curve cryptography	https://youtu.be/2RVLBUncHJk https://youtu.be/_BCYCNYgXm8
8	IV	Digital Signature Algorithm	https://youtu.be/FOWYDeTNRQ4 https://youtu.be/EYOmHSxSOMA
9	V	Firewall	https://youtu.be/j8X8kiGalYI
10	V	Viruses	https://www.coursera.org/lecture/aruba- network-security-basics/viruses-UPwsb

Course Designer

1. Dr.R.Anitha Cruz, Assistant Professor
| CATEGORY | L | Т | Р | CREDIT |
|----------|----|---|---|--------|
| CORE | 86 | 4 | - | 5 |

- To familiarize the students with basic concepts of Fluid Dynamics as the subject has got application in medical, astrophysical, geophysical, agricultural, aero dynamical and other related disciplines.
- To develop the problem-solving skills essential to fluid dynamics in practical applications.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowled geLevel
CL01	Understand the fundamental knowledge of fluids and its properties	K2
CLO2	Apply the concepts and equations of fluid dynamics	K3
CLO3	Analyze thermodynamic control volume concepts in fluid dynamics for applications that include momentum, mass and energy balances	K4
CLO4	E v a l u a t e the approximate solutions of the Navier-Stokes equation	K5
CLO5	Create a role of fluid dynamics in day-to-day life	K6

Mapping with Programme Learning Outcomes

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

CORE XII – SEMESTER III - FLUID DYNAMICS (MTH2112)

Introductory Notions - Velocity - Streamlines and path lines - Stream tubes and filaments

- Fluid body - Density - Pressure - Differentiation following the fluid - Equation of continuity - Boundary condition - Kinematical and physical - Rate of change of linear momentum - Equation of motion of an inviscid fluid.

Euler's momentum theorem - conservative forces - Bernoulli's theorem in steady motion

- Energy equation for inviscid fluid - Circulation - Kelvin's theorem - Vortex motion -Helmholtz equation.

Unit-III

Two dimensional motion - Two dimensional functions - Complex potential - basic singularities - Source and sink vortex - Doublet - circle theorem - flow past a circular cylinder with circulation - Conformal transformation - Blasius theorem - Lift force .

Unit-IV

Viscous flows - Navier-stokes equations - Vorticity and circulation in a viscous fluid - Steady flow through an arbitrary cylinder under pressure - Steady couette flow between cylindersin relative motion - Steady flow between parallel planes.

Laminar boundary layer in incompressible flow - Boundary layer concept boundary layer equations - displacement thickness - momentum thickness - kinetic energy thickness - integral equation of boundary layer - flow parallel to semi infinite flat plate - Blasius equationand its solution in series.

Unit-I

Unit-II

Unit-V

(17 hrs)

(18 hrs)

(17 hrs)

(18 hrs)

(16 hrs)

Text Books

S. No	Author	Title of the book	Publishers	Year of		
				Publication		
1.	L.M. Milne Thomson	Theoretical Hydro	Dover Publications,	2011		
	Units I & II	Dynamics	New edition			
2.	N. Curle and H.J. Davies	Modern Fluid	D.Van Nostrand	1968		
	Units III, IV & V	Dynamics	Company Ltd,			
		Volume I	London			
	Unit I & II: Chapter I: 1.	0 -1.3				
	Chapter III: 3.10 – 3.53 omit 3.32 - 3.44					
	Unit III -IV & V: Chapter III : 3.1 –3.7.5. omit 3.4(full) and 3.5 -3.5.3					
	Chapter '	V : 5.1 - 5.3.3 Ch	apter VI : 6.1 - 6.3.1. O	mit 6.2.2		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1	F.D Shanti Swarup	Fluid Dynamics	Krishna Prakashan media P (Ltd) Meerut	2000
2	M.D Raisinghania	Fluid Dynamics (with Hydrodynamics)	S.Chand & Company	2003

Reference for E – Content

Unit I: https://nptel.ac.in/courses/112104118

Unit II: https://nptel.ac.in/courses/112104118/14

Unit III: http://web.mit.edu/16.unified/www/FALL/fluids/Letures/f15.pdf

Unit IV: https://nptel.ac.in/courses/101103004/27

Unit V: <u>https://nptel.ac.in'courses/Webcourses-contents/IIT-KANPUR/FLUID-MECHANICS/ui/courses_home-9.htm</u>

Pedagogy

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

Course Designer

1. Mrs.K.Sharmilaa, Assistant Professor TH 75

SEMESTER III – SPECIAL PAPER

RESEARCH METHODOLOGY (MTH19S1)

Credits : 2

Total duration : 28 Hrs

Objective

To motivate the students in Research Oriented Topics.

Unit I

Research Methodology: An Introduction Meaning, Objectives, and Types of research, Research Process, Criteria of Good Research Interpretation and Report Writing

Meaning of Interpretation, why Interpretation? Technique of Interpretation, Precaution of Interpretation, Significance of Report Writing, different steps in Writing report, Layout of the research Report, Types of **Reports, Oral Presentation,** Mechanics of writing a Research report, Precautions of Writing Research Reports

Unit II

Text, Symbols, and Commands: Command names and arguments -Environments -Declarations - Lengths -Special characters -Fine-tuning text - Word division Document Layout and Organization: Document class -Page style - Parts of the document - Table of contents

Unit III

Displayed Text: Changing font - Centering and indenting - Lists - Generalized lists - Theorem-like declarations - Tabulator stops - Boxes - Tables - Printing literal text - Footnotes and marginal notes - Comments within text. Mathematical Formulas: Mathematical environments - Main elements of math mode -Mathematical symbols Additional elements - Fine-tuning mathematics

(6 Hrs)

(6 Hrs)

(5 Hrs)

Unit IV

(6 Hrs)

Post Script and PDF : LATEX and PostScript - **Portable Document Format Math Extensions with AMS-LATEX:** Invoking AMS-LATEX - Standard features of AMS-LATEX - Further AMS-LATEX packages -The AMS fonts

Unit V

(5 Hrs)

Research Ethics and Responsible Conduct in Research: Brief history and analytical basis of research ethics, responsible conduct in research (Honesty in Science: Integrity, Authorship, Conflicts of Interest, Privacy and Confidentiality, Informed Consent, Risk/Benefit Assessment), The legal regulation of research ethics in India (From UGC, MHRD and other governing agencies), Regulatory requirements relevant to international research.

Text books

S. No	Author	Title of the book	Publishers	Year of Publication		
1.	C.R.Kothari	Research Methodology (Methods and Technique)	New Age International Pvt. Ltd.	Reprint 2010		
2.	H.Kopka an P.W.Daly	A Guide to Latex	Fourth Edition Addition Wile London	2003		
	Unit II: Chapter 2 & 3Unit III: Chapter 4 & 5Unit IV: Chapters 10 & 12					
3.	Unit V https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf					

Reference Books

S. No	Author	Title of the book	Publishers	Year
				Of
				Publication
1.	S.D.Sharma	A Text Book of Scientific and Technical	Sarup& Sons,	2007
		Communication Writing for Engineers and Professionals	New Delhi	
2.	George A. Gratzer	Math Into LaTeX: An	Springer-Verlag	1996
		Introduction to LaTeX and AMS-LaTex		
2	Ctofor Votterite			2011
3.	Steran Kottwitz	LaTeX Beginner's Guide	Ltd	2011
4.		On Being a Scientist, A Guide to Responsible		
		Conduct in Research: Third Edition (2009)		
5.		Role of the Ethics Committee: Helping To		
		Address Value Conflicts or Uncertainties		
		Author links open overlay panel Mark P.Aulis		
		Robert M.Arnold		
6.		Research Regulatory Compliance 1st Edition		
		(Mark Suckow, Bill Yates eBook		
		ISBN: 9780124200654)		
7.		Recent research ethics policy from		
		Government of India.		

Pedagogy

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

Reference for E – Content

S.No	Unit	Concept	Link
1	Ι	An introduction Meaning, Objectives	https://youtu.be/DsRWqZuGNMk
2	Ι	Types of research	https://youtu.be/TFaKHyJGqvQ
3	Ι	Research Process	https://youtu.be/07nYgNTWz7Q
4	Ι	Types of Reports	https://youtu.be/bGK124OIx7k

5	Ι	Oral Presentation	https://youtu.be/LzIJFD-ddoI
6	II	Fine tuning text	https://voutu.be/x66kkDnbzi4
7	II	Parts of the document - Table of contents	https://youtu.be/4zRPV9F1STI
8	III	Changing font	https://youtu.be/200HAfTMySs
9	III	Tables	https://youtu.be/LSdHEYhXkWU
10	III	Footnotes	https://youtu.be/2J4_0FgNKaU
11	TIT	Mathematical symbols	https://woutu.be/BougkW/Vlfzg
11	111	Watternatical symbols	
12	IV	Post Script and PDF	https://youtu.be/VUT7MbF-kL0
13	IV	Portable Document Format Math Extensions with AMS-	https://voutu.be/331YxgOJUGw
		LATEX:	
14	V	Brief history of research ethics	https://youtu.be/SbWLV5XMQYY
15	V	Honesty in Science: Integrity	https://youtu.be/pnhzYXcxhRU
16	V	Conflicts of Interest	https://youtu.be/Ml0XQLQEqAc
17	V	Privacy and Confidentiality	https://youtu.be/GutcK1KP3nk
Cour	se Desi	jøner	

- > To enable the students to learn mathematical concepts
- > To build mathematical models of real-world systems, analyze them and make predictions about behavior of these systems.

Course Learning Outcomes

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

CLO	CLO Statement	Knowledge
No		Level
CLO1	Understand the importance of Mathematical modeling in the real world	K2
CLO2	Apply and articulate what type of modeling techniques are appropriate for a given physical system	K3
CLO3	Analyses a mathematical model of a given physical system and analyze it, make predictions	K4
CLO4	Evaluate the findings from the methods applied for the problem	K5
CLO5	Create a analyze and simulate mathematical models	K6

Mapping with Programme Learning Outcomes

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

ELECTIVE V - SEMESTER III - MATHEMATICAL MODELLING (MTH21E5)

Unit-I

Syllabus

Mathematical Modeling through Systems of Ordinary differential Equations of the First Order : Mathematical modeling in population dynamics, *Mathematical modeling in Arms Race, Battles and international Trade in terms of systems of ordinary differential equations*- Mathematical modeling in dynamics through systems of ordinary differential equations of first order.

Unit-II

Mathematical Modeling through difference equations: The need for Mathematical modeling through difference equations - Some simple models - Basic theory of linear difference equations with constant coefficients - Mathematical modeling through difference equations in economics and finance.

Unit-III

Mathematical Modeling through difference equations (contd.): Mathematical modeling through difference equation in population dynamics and genetics -Mathematical modeling through difference equations in probability theory -Miscellaneous examples of mathematical modeling through difference equations.

Unit-IV

Mathematical modeling through Graphs: Situations that can be modeled through graphs – Mathematical models in terms of directed graphs - mathematical models in terms of signed graphs - Mathematical models in terms of weighted graphs.

Unit-V

Mathematical Modeling through calculus of Variations and Dynamic Programming : Optimization principles and techniques - Mathematical modeling through calculus of variations - Mathematical Modeling through dynamic programming.

(12 hrs)

(11 hrs)

(11 hrs)

(11 hrs)

(11 hrs)

S. No	Author	Title of the book	Publishers	Year of Publication			
1.	J.N. Kapoor	Mathematical Modelling	Willey Eastern	Reprint 2000			
			Limited				
	Unit I: Chapter 3: 3.1,3.2, 3.5 and 3.6						
	Unit II: Chapter 5:5.1 - 5.3						
	Unit III: Chapter 5: 5.4- 5.6						
	Unit IV: Chapter 7:7.1 to 7.4						
	Unit V: Chapter 9:9.1 to 9.3						

Reference Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1	D.J.G James and	Case studies in	Stanly Thames,	2003
	J.J Macdonald	mathematical Modeling	Cheltenham	
2	C.Dyson, Elvery	Principles of	Academic Press	2001
		Mathematical Modeling	,New York	

Pedagogy

Chalk & talk, PPT, E-Content, Group discussion, Seminar, Quiz, assignment and Peer learning

Reference for E – Content

S.No	Unit	Concept	Link
1	Ι	Mathematical modeling in Arms Race, Battles and international Trade in terms of systems of ordinary differential equations	https://slideplayer.com/slide/3553004/ http://bionics.seas.ucla.edu/education/MAE_1 82A/MAE182A_Project_09.pdf https://slideplayer.com/slide/3422456/
2	П	The need for Mathematical modeling through difference equations	https://youtu.be/_4KMohr9iCU https://youtu.be/8qGYdGLbwpc https://www- users.york.ac.uk/~pjh503/mathematical_mode l/math_model10.pdf
3	Ш	Some simple models	https://onlinecourses.nptel.ac.in/noc22_ma20/ preview https://towardsdatascience.com/gans-vs-odes- the-end-of-mathematical-modeling- ec158f04acb9
4	II	Mathematical modeling through difference equations in economics and finance	https://youtu.be/v2Pvki35H0U https://youtu.be/VzlBEcs1fj4
5	III	Mathematical modeling through difference equation in population dynamics and genetics	https://www.slideshare.net/arupparia/introduct ion-to-mathematical-modelling-42588379 https://www.coursera.org/lecture/ordinary- differential-equations/4-2-population- dynamics-i-LNhA1
6	III	Miscellaneous examples of mathematical modeling through difference equations	https://web.ma.utexas.edu/users/m408s/m408 d/CurrentWeb/LM9-1-2.php https://math.libretexts.org/Bookshelves/Calcul us/Map%3A_Calculus_Early_Transcendenta ls_(Stewart)/09%3A_Differential_Equations/9 .01%3A_Modeling_with_Differential_Equations/9
7	IV	mathematical models in terms of signed graphs -	https://youtu.be/CIwfCxkZ5Wk

8	IV	Mathematical models in terms of weighted graphs.	https://study.com/academy/lesson/graphs-in- discrete-math-definition-types-uses.html
9	V	Optimization principles and techniques	https://youtu.be/o-fPT0HyF2U https://youtu.be/5dRGRueKU3M
10	V	Mathematical Modeling through dynamic programming	https://youtu.be/dND9IsjL110 https://www.coursera.org/lecture/operations- research-algorithms/5-6-mathematical- modeling-2-0ruoh

Course Designer

Mrs. A.Neerajah, Assistant Professor

- To introduce students to the fundamentals of tensor algebra.
- To expose students to mathematical applications of tensor algebra which helps them to solve diverse problems which occur in real life situations

Course Learning Outcomes

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

CLO	CLO	Knowledge
Number	Statement	Level
CLO1	Understand the concept of tensor variables and difference from scalar or	
	vector variables.	K2
CLO2	Apply the base vectors, metric tensors and strain tensors in an arbitrary coordinate system.	К3
CLO3	Analyze the Christoffel symbols which provide a concrete representation of	
	the connection of (pseudo-)Riemannian geometry in terms of coordinates on	K4
	the	
	manifold.	
CLO4	Evaluate the Riemannan-Christoffel tensor to problems of differential	K 5
	geometry,	KJ
	electrodynamics and relativity.	
CLO5	Create a tensor representation from interdisciplinary areas.	K6

Mapping with Programme Learning Outcomes

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

SEMESTER III – ELECTIVE VI TENSOR ANALYSIS (MTH21E6)

Unit I

Tensor theory: Scope of Tensor Analysis - transformation of coordinates - properties of admissible transformations of coordinates- transformation by invariancetransformation by covariance and contravariance - contravariant tensor -covariant tensor- tensor character of covariant and contravariant laws – algebra of tensors.

Unit II

Quotient law - symmetric and skew-symmetric tensors - relative tensors - the metric tensor- the fundamental and associated tensors.

Unit III (11 Hrs)

Christoffel's symbols - transformation of Christoffel's symbols - covariant differentiation of tensors - Ricci's theorem.

Unit IV

Riemann - Christoffel tensor - properties of Riemann-Christoffel tensors -Ricci tensor -Bianchi identitites -Einstein tensor.

Unit V

(11 Hrs) Riemannian and Euclidean spaces - existence theorem - the e-systems and the generalized Kroneckerdelats - application of the e-systems to determinants - tensor character of generalized Kronecker deltas.

(11 Hrs)

(12 Hrs)

(11 Hrs)

S. No	Author	Title of the book	Publishers	Year of Publication		
1.	I.S.Sokolnikoff	Tensor Analysis	John Wiley	1952		
		Theory and Applications	and sons			
	Unit I Chapter	- 2 Sections: 18 -25		I		
	Unit II Chapter	-2 Sections: 26 -30				
	Unit III Chapter	-2 Sections: 31 - 35				
	Unit Chapter – Sections: 36 – 38 IV 2					
	Unit Chapter V	- 2 Sections: 39 - 41				

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	A.W.Joshi	Matrices and	New age	2005
		tensors in	international private	
		Physics	limited	
2.	A.I.Borisenk	Vector and	Dover publication,	1968
	o and	tensor analysis	New York	
	I.E.Tarapov	with		
		applications		
3.	PavelG	An introduction	Springer, New York	2013
	rinfled	to tensor		
		analysis and the		
		calculus of		
		movingsurfaces		

Pedagogy

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

Reference for E – Content

S.No	Unit	Торіс	Link
1	Ι	contravariant tensor –covariant tensor	https://youtu.be/JgaksKQOIsQ
2	Ι	tensor character of covariant and contravariant laws	https://youtu.be/JgaksKQOIsQ
3	II	symmetric and skew-symmetric tensors	https://youtu.be/15lOIXgFkPE
4	Π	the metric tensor	https://youtu.be/Dn0ZZRVuJcU
5	III	Christoffel's symbols	https://youtu.be/aZFrbahsyUQ
6	III	transformation of Christoffel's symbols	https://youtu.be/3T7gF98VBm0
7	IV	properties of Riemann- Christoffel tensors	https://youtu.be/MkxGFNtLiS0
8	IV	Ricci tensor	https://youtu.be/ZhDNijOEw0Y
9	V	Tensor character of generalized Kronecker deltas.	https://youtu.be/0HuzJLwkfaY

Course Designer

1. Dr.T.Brindha, Associate Professor

ALLIED SYLLABUS

BSc FPM-Allied - Numerical And Statistical Techniques (TH21A03)

BSc CS & AI -Allied - Discrete Mathematics (TH21A27)

COURSE NAME	CATEGORY	L	Т	Р	CREDIT
STATISTICAL TECHNIQUES	ALLIED	86	4	-	5
SEMESTER III					

- To present students the Basic concepts of Numerical Methods and Statistics.
- To enable the students to find the practical applications to the real world problems.

Course Learning Outcomes

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

CLO	CLO Statement	Knowledge
Number		Level
CLO1	Recall basic Mathematics and Statistical concepts	K1
CLO2	Interpret results from the application of standard statistical and numerical methods.	К2
CLO3	Understand the concepts of Numerical differentiation and Theoretical distributions	К3
CLO4	Applying numerical and statistical methods to solve complex problem.	K3
CLO5	Analyse and evaluate the accuracy of common numerical and statistical methods.	K4

Mapping with Programme Learning Outcomes

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

SEMESTER III Numerical and Statistical Techniques II B.Sc (FPM)

Credits :4

Subject Code :TH21A03

Syllabus

Unit I

Unit II

Unit III

Solution of Linear Simultaneous Equations: Gauss elimination - Gauss Jordan - Gauss Seidel and Gauss Jacobi methods -simple problems. Interpolation: Newton Forward and Backward Interpolation Formulae.

Numerical Differentiation: Newton's Forward Difference - Newton's Backward Difference, Numerical Integration: Introduction, Newton-Cotes Quadrature formulas: trapezoidal rule, Simpson's 1/3 and 3/8 rules, Taylor's series method.

Skewness - 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.

Unit IV

Probability: Introduction - probability defined - Importance of the concept of probability - Calculation of probability - Theorems of probability (statements only) – Mathematical expectation-Simple problems.

Unit V

Theoretical Distributions: Binomial distribution - Poisson distribution and Normal distribution (without derivations & proof).

17 Hrs

17Hrs

17 Hrs

16 Hrs

19 Hrs

Hours: 86

Text Books

S.No	Author	Title of the	Publishers	Year of		
		book		Publication		
1	B.S. Grewal	Numerical	Khanna	2014		
		Methods in	Publishers			
		Engineering and				
		Science with				
		Programs in C				
		& C++				
	Unit I :Chapter III &VII: 3.3:(3,4), 3.5:(1,2) &7.1-7.3					
	Unit II:Chapter V	YIII& X: 8.1, 8.2:(1	,2),8.4,8.5:(I,II,III)	, 10.3		
2	S.P.Gupta	Statistical	Sultan Chand &	2005		
		methods	Sons			
			Publications			
	Unit III: Volume I: Chapter 9(till measures of skewness),10,11.(pg: 32					
	341, 377-412, 435-454) Unit IV : Volume-II Chapter 1(till Baye's theorem) (pg: 751-771)					
	Unit V : Volume-	IIChapter2 (pg:805	5-824, 826-834, 83	6-856)		

Reference Books

S.No	Author	Title of the book	Publishers	Year of Publication
1	P.A.Navanitham	Business Mathematics And Statistics	Jai Publishing Company	2003
2	S.C Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Publications	2001
3	P.Kandasamy, K.Thilagavathy and K.Gunavathy	Numerical Methods	S.Chand and company LTD Reprint	2007
4	V.K.Kapoor	Fundamentals of	Applied Statistics Sultan Chand & Sons	2007

MOOC learning

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

(Lectures by Prof. Ameeya Kumar Nayak and Prof. Sanjeev Kumar, Department of Mathematics, Indian Institution of Technology Roorkee)

Lecture 02 Gaussian elimination with partial pivoting

Lecture 04 Jacobi and Gauss Seidel methods

Lecture 20 Newton's Forward Difference & Newton's Backward Difference

Lecture 34 Simpsons 1/3rd rule and 3/8 rule https://nptel.ac.in/courses/111/106/111106112/ (6 Lectures by Prof. G.Srinnivasan, Department of Management Studies, Indian Institution of Technology Madras)

Lecture 12 Probability

Lecture 13 Rules of probability

Lecture 19 Binomial distribution

Lecture 20 Poisson distribution

Note

Question paper setters to confine to the above text books only

Pedagogy

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

Reference for E – Content

S.No	Unit	Торіс	Link
1	1	Gauss Jordan	https://youtu.be/CsTOUbeMPUo
2	1	Newton Forward Interpolation Formulae	https://youtu.be/4vFwT_ZIntg
3	2	Numerical Integration: Introduction	https://youtu.be/zadUB3NwFtQ
4	2	Taylor's series method.	https://youtu.be/purcJiAs8FE
5	3	Skewness	https://youtu.be/XSSRrVMOqlQ
6	3	Types of correlation	https://youtu.be/XWFMypQkZ7Y

7	3	Properties of the coefficient of the correlation	https://youtu.be/-nhKXETLQnM
8	3	Regression analysis	https://youtu.be/DtOYBxi4AIE
9	4	Importance of the concept of probability	https://youtu.be/oeyZNemZe04
10	4	Mathematical expectation-	https://youtu.be/qYQmXsa-LPs
11	5	Binomial distribution	https://youtu.be/e04_wUoscBU
12	5	Poisson distribution	https://youtu.be/cPOChr_kuQs
13	5	Normal distribution	https://youtu.be/rzFX5NWojp0

Course Designer

Dr. R. Sasirekha, Assistant Professor, Department of Mathematics

SEMESTER III

CATEGORY	L	Т	Р	CREDIT
Theory	86	4	-	5

Preamble

Principle of Mathematical Structures which are essential and related to the concepts of Computer Science. This helps the students to approach any Mathematical Problem which arise in the field of Computer Science

Course Learning Outcomes

CLO Number	CLO Statement	Knowle dge
		Level
CLO1	and Outline the understanding of Tautology and Equality relations thereby helps students to understand ambiguity and disagreement in real world problems	K1
CLO2	Apply the Lattices and Boolean algebras enables one to apply in the applications of logic, circuit theory, and probability	К2
CLO3	Analysis the importance of Graph Theory in Computer Science	K3
CLO4	Evaluate algebraic concepts in Coding theory using group codes enhances their ability to detect and correct errors	K4

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

Mapping with Programme Learning Outcomes

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

SEMESTER – III

ALLIED - DISCRETE MATHEMATICS

B.SC Computer Science and Artificial Intelligence Hours 86

Credits 5

Subject Code :TH21A27

Unit I

Mathematical Logic: Connectives- Statement Formulas and Truth Tables - Conditional and

Biconditional - Well formed Formulas - **Tautologies** - Equivalence of Formulas -Duality law -Tautological implications -Normal forms –Theory of inference for the Statement Calculus - Predicate Calculus.

Unit II

Coding Theory: Introduction – Hamming distance Encoding a message – **Group codes** – Procedure for generating Group Codes – Decoding and Error Correction – An example of a Simple error correcting code.

Unit III

Formal languages and Automata: Grammar and Languages -Phrase Structure grammar -

Types of Phrase Structure Grammar – Backus-Naur form [BNF] - Finite State Acceptors and Regular Grammars : Deterministic finite automata-Non-Deterministic finite-State automata-Conversion of Non-Deterministic finite automata to finite state automata.

Unit IV

Lattice and Boolean Algebra: Lattices as Partial ordering set – Some Properties of Lattices-Distributive lattices-Complemented Distributive Lattices-Boolean algebra – Boolean Function – Representation and Minimization of Boolean function using K-Map.

Unit V

Graph Theory: **Basic Concepts of Graph Theory** – **Path**, Reachability and Connectedness – Circuits- **Hamiltonian Paths- Euler paths**-Matrix representation-Incidence matrix-Adjacency matrix-Tree and Binary tree – Theorems-Statement only(No Proof).

17 Hrs

17 Hrs

16 Hrs

19 Hrs

17 Hrs

S.	Author	Title of the book	Publishers	Year of Publication		
No						
1.	J.P.Tremblay and R.Manohar	Discrete Mathematical Structures with Applications to Computer Science	McGraw Hill Publishing Company	Edition 1997, Reprint 2008		
	Unit I : Section: 1.2.1 -1.2.4, 1.2.6 -1.2.11, 1.3.1 -1.3.4, 1.4.1 – 1.4.2, 1.5.1 -1.5.4 Unit III : Section: 3.3.1 -3.3.3, 6.1.1 Unit IV : Section: 4.1.1 -4.3.1, 4.4.1, 4.4.2 Unit V : Section: 5.1.1 -5.2.2					
2.	Dr. M.K. Venkataraman, Dr. N. Sridharan and N. Chandrasekaran Unit II: Chapter 8	Discrete Mathematics Sections 8.1 – 8.7	The National Publishing company, Chennai	First edition Reprint 2003,		

Reference books

S.No	Author	Title of the book	Publishers	Year of publication
1	T.Veerarajan	Discrete Mathematics with Graph Theory and Combinatorics	Tata mcgraw-Hill publishing company Limited	2008
2	NarSinghDeo	Graph Theory with Applications to Engineering and Computer Science	PHI, India	2006
3	T. Santha and P. Radha	Discrete Mathematics for Computer Science and Applications	Kalaikathir Publications	2002

Reference for E – Content

S.No	Unit	Concept	Link
1	I	Logical Inferences	https://youtu.be/6UgZc0R LCQ
2	II	Group codes	https://youtu.be/XVZK0PaxRGc
3	III	Phrase Structure grammar	https://youtu.be/0VynGtewAfc
4	IV	Lattices	https://youtu.be/y0HcmNI5K4E
5	IV	Boolean algebra	https://youtu.be/0Dx7r0PFyUM
6	V	Basic definition of Graph	https://youtu.be/o9SdjrLyAug
7	V	Walks, paths and circuits operations on graphs	https://youtu.be/fSHwjxsGsH4
8	V	Euler graphs, Hamiltonian circuits	https://youtu.be/28x7AGXJTa8

Pedagogy

Chalk and talk, Power point presentation, E-Content, Group discussion, Seminar, Quiz, Assignment and Peer learning

Course Designer

Dr.R.Anitha Cruz, Assistant Professor, Department of Mathematics

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER MTH2113	FUNCTIONAL ANALYSIS	CORE	86	4	I	5
111112115						

- Students will learn the basic concepts and theorems of functional analysis and its applications.
- The student is able to apply knowledge of functional analysis to solve mathematical 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 properties of normed linear spaces and construct examples of such spaces	K2
CLO2	Apply the basic theoretical techniques to analyze linear functionals and operators on Banach and Hilbert spaces.	К3
CLO3	Analyze orthonormality to Fourier series expansions of functions	K4
CLO4	Evaluate the regular and singular elements of topological divisors	K5
CLO5	Create and examine the spectrum of an operator	K6

Mapping with Programme Learning Outcomes

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

Syllabus

Unit I

CORE PAPER XIII - SEMESTER IV - FUNCTIONAL ANALYSIS (MTH2113)

(18 Hrs)

(17 Hrs)

(17 Hrs)

(16 Hrs)

(18 Hrs)

Banach spaces - The definition and some example - Continuous linear transformations - **The Hahn -Banach theorem - The natural imbedding of N in N**** - The open mapping theorem - The Closed graph theorem.

Unit II

The conjugate of an operator - Hilbert spaces - Definition and some simple properties - **Orthogonal complements** - Orthonormal sets.

Unit III

The Conjugate space H* - The adjoint of an operator - **Self adjoint operators** - Normal and unitary operators - Projections.

Unit IV

Matrices - Determinants and the spectrum of an operator - The spectral theorem.

Unit V

The definition and some examples of Banach algebras - Regular and singular elements -Topological divisors of zero - The spectrum - The formula for the spectral radius.

Text Book

	Author	Title of the book	Publishers	Year of		
S. No				Publication		
1.	G.F. Simmons	Introduction to Topology and Modern Analysis	Tata McGraw -Hill company	1983		
	UnitI :Sections : 46-50 Unit II :Sections : 51 -54					
	Unit III :Sections : 55 -59					
	Unit IV :Sections : 60 -63					
	Unit V :Sections : 6	4 -68				

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	A.E Taylor	Introduction to Functional Analysis	John Wiley and Sons, NewYork	1958
2.	C.Goffman and G. Pedrok	A Course in Functional Analysis	Prentice Hall of India, New Delhi	1987
3.	G.Bachman and L.Narici	Functional Analysis	Academic Press, New York	1966, 1 st Edition
4.	L.A. Lustenik and V.J. Sobolev	Elements of Functional Analysis	Hindustan Publishing Corporation, New Delhi	1971, 1 st Edition

Pedagogy

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

Course Designer

Mrs.A.Neerajah, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER	MATHEMATICAL METHODS	CORE	86	4	-	5
MTH2114						

To give an introduction to mathematical methods for solving hard mathematics problems that arises in the sciences.

To give an experience in the implementation of Mathematical concepts like integral transforms, integral equations and calculus of variations in various field of Engineering.

Course Learning Outcomes

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

CLO	CLO	Knowledge
Number	Statement	Level
CLO1	Understand the knowledge of various mathematical concepts and techniques requiredforsuccessful application of mathematics in physics and related sciences	К2
CLO2	Apply various transforms and integral equations to solve multidisciplinary application problems	K3
CLO3	Analyze and solve particular cases of Fredholm and Volterra integral equations and variational problem by constructing an appropriate functional, and solving the Euler-Lagrange equations.	K4
CLO4	Evaluate the ability to present their results	K5
CLO5	Create the strategies using mathematical methods to solve real world problems	K6

Mapping with Programme Learning Outcomes

CLOs/PLOs	PLO 1	PLO 2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	М
CLO3	S	S	М	S	S
CLO4	S	S	S	М	S
CLO5	S	S	S	S	М

Syllabus

CORE PAPER XIV - SEMESTER IV - MATHEMATICAL METHODS (MTH2114) Unit-I (17hrs)

Fourier transforms: Fourier sine and cosine transforms - Fourier transform of derivatives

- Fourier transform of simple functions - Convolution integral - Parseval's Theorem - Solution of PDE by Fourier transforms - Laplace equation in half plane - Laplace equation in an infinite strip-Laplace equation in semi infinite stripe - The Linear diffusion equation on a semi infinite line - The two dimensional diffusion equation.

Unit-II

Hankel Transforms: Properties of Hankel transforms - Hankel inversion theorem of derivatives of functions (proof is omitted) - The Parseval's relation - Relation between Fourier and Hankel transforms - Axisymmetric Dirichlet problem for a half space - Axisymmetric Dirichlet problem for a thick plate.

Unit-III

Integral equations: Type of integral equations - Integral Fredholm alternative approximate Method - Equation with separable Kernel - Volterra integral equations - Fredholm's theory - Fredholm's First - second and third theorems.

Unit-IV

Application of integral equation to ordinary differential equation - Initial value problems - Boundary value problems - Singular integral equations - Abel integral equation.

Unit-V

Calculus of Variations: Variation and its properties - Euler's equation - Functionals of the integral form - Functional dependent on higher order derivatives - Functionals dependent on the Functions of several independent variable - Variational problems in parametric form -Applications.

(17 hrs)

(18hrs)

(19 hrs)

(15 hrs)

Text Books

S. No	Author	Title of the book	Publishers	Year of		
				Publication		
1.	Ian N. Sneddon	The use of Integral	McGraw Hill Book	1979		
	Unit I and II	Transforms	Company			
2.	Ram P. Kanwal	Linear Integral	Academic Press, New	2012		
	Unit III and IV	Equations : Theory	York			
		and Technique				
3.	L. Elsgolts	Differential equations	University Press of the	2003		
	UNIT V	and calculus of	Pacific			
		variations				
	UnitI : Cl	hapter 2: 2.4 – 2.7, 2.9–2.	10,			
		2.16 (2.16.1(a,b)	,c)), (2.16.2(a,b))			
	Unit II : Cl	hapter 5: $5.2 - 5.4$, $5.6 - 5.4$	5.7,5.10(5.10.1,5.10.2)			
	Unit III : Cl	Unit III : Chapter 2: 2.3 – 2.5, Chapter 3: 3.3 – 3.4				
	UnitIV : Chapter 5: 5.1 – 5.2, Chapter 8: 8.1 – 8.2					
	UnitV : Cl	hapter 6: 6.1 –6.7				

Reference Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1	TulsiDass and	Mathematical Methods in	University	1998
	Sathish K. Sharma	Classical and Quantum	Press(India)	
		Physics	Private Limited	
2	A.S Gupta	Calculus of Variations with	Prentice Hall of	2005
		Application	India, New Delhi	
3	M. D. Raisinghania	Integral Equations and	S. Chand & Co.,	2007
		Boundary Value Problems	New Delhi	
4	SudirK.Pundir and	Integral Equations and	PragatiPrakasam,	2005
	RimplePundir	Boundary Value Problems	Meerut	

Pedagogy

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

Course Designer

Dr.R.Sasirekha, Assistant Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
MTH2115	MATHEMATICAL PROGRAMMING	CORE	86	4	-	4

- Ability to understand and analyze managerial problems in industry so that they are able to • use resources (capitals, materials, staffing, and machines) more effectively;
- Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry
- Provides a quantitative technique or a scientific approach for making better decisions for operations under the control.

Course Learning Outcomes

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

CLO No.	CLO Statement	Knowledge level
CLO1	Understand the importance and value of Operations Research and mathematical modeling in solving practical problems in industry	K ₂
CLO2	Apply how to use variables for formulating complex mathematical models in management science, industrial engineering and Transportation science and in real life.	K3
CLO3	Analyze a managerial decision problem and formulate into a mathematical model	K4
CLO4 CLO5	Evaluate the complex systems in the best possible way Create and examine the non linear programming problems	K5 K6

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO	PLO	PLO4	PLO5
		2	3		
CLO1	S	S	S	М	S
CLO2	S	S	S	М	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

ELECTIVE VII- SEMESTER IV

MATHEMATICAL PROGRAMMING (MTH2115)

Unit I:

Advanced Linear Programming -- From Extreme points to Basic solutions - Generalized Simplex Tableau in matrix form - Development of the Optimality and Feasibility Conditions -Revised Simplex Algorithm – Matrix definition of dual problem– Optimal dual solution.

Unit II : (17 hrs)

Integer Programming – Integer Programming Algorithm –Cutting Plane Algorithm – Deterministic Dynamic Programming - Recursive nature of computations in D.P. - Forward and Backward recursion.

Unit III: (18 hrs)

Simulation Modeling : Monte Carlo Simulation – Types of simulation – Sampling from probability distribution – Generation of random numbers.

Unit IV:

Classical Optimization Theory - Unconstraint problems - Necessary and Sufficient Conditions - The Newton - Raphson Method - Constrained problems - Equality constraints (Jacobi Method and Lagrangian method).

Unit V: (18 hrs)

Non-Linear Programming - Unconstrained algorithms - Direct Search Method -Gradient Method – Constraint algorithms – Quadratic Programming.

(17 hrs)

(16 hrs)

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication			
1.	Hamdy A. Taha	Operations Research	Pearson Prentice Hall of India Pvt. Ltd, New Delhi	2008			
	Unit I : Chapter 7 - Sections 7.1-7.2 and 7.4						
	Unit II : Chapter 9 - Section 9.2.2, Chapter 10: Section10.1, 10.2						
	Unit III: Chapter 16 - Section 16.1 – 16.2,16.3.2,16.4						
	Unit IV: Chapter 18 – Section 18.1 and 18.2.1						
	Unit V : Chapter 19 - Section 19.1and 19.2.2						

Reference Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1	KantiSwarup,	Operations Research	Sultan Chand and	2005
	P.K.Gupta, Man		Sons Publishers	
	Mohan			
2	J.K. Sharma	Operations Research	Macmillan India	2007
			Limited	
3	S.S. Rao	Optimization Theory and Applications	Qiley Eastern Ltd.	1990

Pedagogy

Chalk & Talk, PPT, Group discussion, Seminar, Quiz, Assignment, Case Study

Course Designer

Mrs. K. Sharmilaa, Assistant Professor

PROJECT & VIVA VOCE(MTH21PROJ)

Credits:5

Hours Per Week: 6 Hrs

Maximum Marks: 100

Internal Evaluation

I Review – Selection of the field of study, Topic & research design	-15 Marks
II Review – Literature Collection & Data Collection	- 15 Marks
III Review – Analysis & Conclusion Preparation of rough draft	- 20Marks

Total	- 50 Marks
	- 30 Marks
	- 20 Marks
Total	- 50 Marks
	Total

TOTAL - 100 Marks
- > Introduce the fundamental concepts of formal languages, grammars and automata theory.
- > Identify different formal language classes and their relationships

Prerequisite

➤ Knowledge in basic concepts of calculus and matrices

Course Outcomes

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

CLO	CLO	Knowledge
Number	Statement	Level
CLO1	Understand basic concepts in Lattices, formal language and automata	
	theory	K2
CLO2	Apply abstract models of computing, including deterministic (DFA), non-deterministic (NFA), Push Down Automata(PDA)	K3
CLO3	Analyze relate practical problems to languages and automata	K4
CLO4	Evaluate the grammars and recognizers for different formal languages	K5
CLO5	Create the structure of a given formal language using regular expressions and context - free grammars	K5

Mapping with Programme Outcomes

CLOS/PLO	PLO	PLO	PLO	PLO	PLO	PLO
S	1	2	3	4	5	6
CL01.	S	S	S	S	S	S
CLO2.	S	S	S	S	S	S
CLO3.	S	S	S	S	S	S
CLO4.	S	S	S	S	S	S
CLO5.	S	S	S	S	S	S

ELECTIVE VII - SEMESTER IV FORMAL LANGUAGES AND AUTOMATA THEORY (MTH21E7)

UNIT I

(15 hrs)

Lattices and Boolean Algebra: Lattices as Partially ordered sets - Boolean Algebra-Boolean Functions– Representation and Minimization of Boolean Functions.

UNIT II

Grammars and Languages: Discussion of Grammars – Formal Definition of a Language – Notions of Syntax Analysis.

UNIT III (15 hrs) Finite Automata, Regular Expressions and Languages: An Informal Picture of Finite Automata - Deterministic Finite Automata - Nondeterministic Finite Automata –An Application: Text Search - Finite Automata with & Transitions - Regular Expressions - Finite Automata and Regular Expressions – Applications of Regular Expressions – Algebraic Laws for Regular Expressions

UNIT IV

Properties of Regular Languages: Proving languages not to be Regular- Closure properties of Regular Languages- Decision Properties of Regular Languages– Equivalence and Minimization of Automata. **Context - Free Grammars and Languages:** Context - Free Grammars - Parse Trees - Applications of Context - Free Grammars – Ambiguity in Grammars and Languages.

UNIT V

Pushdown Automata :Definition of the Pushdown Automaton - The Languages of a PDA- Equivalence of PDA's and CFG's - Deterministic Pushdown Automata. **Properties of Context - Free Languages :**Normal Forms for Context - Free Grammars - The Pumping Lemma for CFL's - Closure properties of CFL's - Decision properties of CFL's.

(16 hrs)

(10 hrs)

(15 hrs)

Text Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1	J.P.Tremblay and	Discrete Mathematical	McGraw Hill	reprint 2016
	R.P.Manohar	Structures with Applications to Computer Science	Publishing Company	
	UNIT I :	Chapter 4 Section: 4.1.1 - 4.4.2		
	UNIT II :	Chapter 3 Section: $3.3.1 - 3.3$	3.3	
2	John E. Hopcroft,	Introduction to Automata	Pearson Education,	reprint 2005
	Rajeev Motwani,	Theory, Languages, and	2 nd Edition	
	Jeffrey D. Ullman	Computation		
	UNIT III :	Chapter 2 and Chapter 3		
	UNIT IV :	Chapter 4 and Chapter 5		
	UNIT V :	Chapter 6 and Chapter 7		

Reference Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1	T.Veerarajan	Discrete Mathematics	Tata Mcgraw-Hill	2008
		with Graph Theory and	publishing	
		Combinatorics	company Limited	
2	Dr. M.K. Venkataraman,	Discrete Mathematics	First edition	2003
	Dr. N. Sridharan and		Reprint,	
	N. Chandrasekaran		The National	
			Publishing	
			company, Chennai	
3	Peter Linz	Introduction toFormal	Jones & Bartlett	2012
		Language &Automata	Learning, 5 th	
			edition	
4	T. Santha and	Discrete mathematics for	Kalaikathir	2003
	P. Radha	Computer Science and	Publication	
		Applications	S	
5	John Truss	Discrete mathematics for	Pearson	2001
		computer Scientists	Education Ltd,	
			Second edition	

Pedagogy

Chalk & Talk, PPT, Group discussion, Seminar, Quiz, Assignment, Case Study

Course Designers:

- 1. Dr.K.Krishnaveni, Associate Professor
- 2. Dr.M.Nila, Assistant Professor

COURSE	COURSE NAME COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER MTH21E8		ELECTIVE	86	4	-	4

- > To introduce the notion of surfaces and their properties.
- > To study geodesics and differential geometry of surfaces.

Course Learning Outcomes

Upon the successful completion of the course students

Mapping with Course Outcomes

CLO	CLO Statement	Knowledge
Number		Level
CLO1	Understanding and concise arguments involving basic notions and	K2
	constructions of	
	2-dimensional Riemannian geometry, curves and torsion.	
CLO2	Apply important types of curves in surfaces, including principal curves,	K3
	asymptotic curves and geodesics.	
CLO3	Analysis some standard examples in geometry, such as surfaces of constant	V A
	Gaussian curvature, compact and non -compact surfaces, and	K 4
	surfaces of revolution.	
CLO4	Evaluate Gaussian and mean curvatures using variety of methods including	V5
	natch computations direct calculation of the shape operator	KJ
	paten computations, direct calculation of the shape operator	
CLO5	Create connections between geometry and other disciplines, possibly	
	including topology, algebra, analysis, or applied mathematics.	K5

Mapping with Programme Learning Outcomes

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

ELECTIVE VIII - SEMESTER IV

DIFFERENTIAL GEOMETRY (MTH21E8)

UNIT I (18 Hrs) Space Curves: Definition of a space curve - Arc length - tangent - normal and binormal curvature and torsion - contact between curves and surfaces- tangent surface- involutes and evolutes- Intrinsic equations - Fundamental Existence Theorem for space curves-Helics.

UNIT II

Intrinsic Properties of a Surface: Definition of a surface - curves on a surface - Surface of revolution - Helicoids - Metric- Direction coefficients - families of curves- Isometric correspondence- Intrinsic properties

UNIT III

Geodesics: Geodesics - Canonical geodesic equations - Normal property of geodesics- Existence Theorems - Geodesic parallels - Geodesics curvature - **Gauss- Bonnet Theorem** - Gaussian curvature- **surface of constant curvature.**

UNIT IV

Non Intrinsic Properties of a Surface: **The second fundamental form-** Principal curvature - Lines of curvature - Developable – Developable associated with space curves and with curves on surface - Minimal surfaces - **Ruled surfaces** - The fundamental equations of surface theory-Parallel Surfaces.

UNIT V

Differential Geometry of Surfaces: **Compact surfaces whose points are umblics-** Hilbert's lemma - Compact surface of constant curvature - Complete surface and their characterization - Hilbert's Theorem - Conjugate points on geodesics.

MTH

(18 Hrs)

(17Hrs)

(16Hrs)

(17 Hrs)

Text Book

S.	Author	Title of the book	Publishers	Year of
				Publicatio
				n
1.	T.J.	An Introduction	Oxford	1
	Willmore	to Differential Geometry	University Press	986
			-	
	UNIT – I Ch	apter I : Sections 1 to 9.		
	UNIT – II Chap	ter II: Sections 1 to 9.		
	UNIT – III Chaj	pter II: Sections 10 to 18.		
	UNIT – IV Cha	pter III: Sections 1 to 10.		
	UNIT – V Chap	ter IV : Sections 1 to 8		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publicatio
				n
1.	Andrew Pressley	Elementary differential geometry	Springer	2001
2.	Jain S K	Differential geometry	Sarup& Sons	2002
3.	<u>Nayak Kumar</u>	Text book of tensor calculus	Phi Learning	2012
		and differential geometry	Private	
			Limited	
4.	Helgason	Differential geometry lie	American	2010
		groups ,and symmetric spaces	Mathematic	
			al Society	

Pedagogy

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

Course Designer:

1. Dr.T.Brindha, Associate Professor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER MTH1622	ADVANCED COMPUTING TECHNIQUES	THEORY	-	-	-	5

- To understand the basic mathematical elements of the theory of fuzzy
- sets. Introduce concepts in automata theory and theory of computation.
- Identify different formal language classes and their relationships

Course Outcomes

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

СО	CO Statement	
Number		Level
CO1	Understand crisp set, fuzzy sets	K2
CO2	Apply Cryptographic Protocols	K3
CO3	Analyze Cryptographic Algorithms	K4
CO4	Evaluate Automata and Regular expressions	K5
CO5	Create finite automata	K5

Mapping with Programme Outcomes

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

ALC - SEMESTER IV

ADVANCED COMPUTING TECHNIQUES (MTH1622)

Unit I

Crisp sets - union and intersection of crisp sets - Fundamental properties of Crisp operations - Fuzzy sets - union and intersection of fuzzy sets - Fundamental properties of fuzzy operations.

Unit II

Cryptographic Protocols - Cryptographic Techniques.

Unit III

Cryptographic Algorithms - Mathematical Background - Data encryption Standard - other block ciphers.

Unit IV

Automata and Regular expressions - Finite Automata - Kleene's theorem - derived languages.

Unit V

Finite automata with output - Register machines.

Text Books

S. No	Author	Title of the book	Publishers	Year of
				Publication
1.	Bruce Schneier	Applied Cryptography	John Wiley & Sons,	2006
		Unit II & III	INC	
2.	George .J. Klir and	Fuzzy Sets and Fuzzy	PrenticeHall	2000
	Bo Yuan	Logic Unit I		
3.	John Truss	Discrete mathematics	Pearson Education Ltd,	2001
		for computer Scientists	Second edition	
		Unit IV & V		

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Bruce Schneier, Niels Ferguson	Practical Cryptography	John Wiley & Sons, INC	2003
2.	J.P.Tremblay and R. Manohar	Discrete Mathematical Structures with Applications to Computer Science	Tata McGrawHill	2008

Pedagogy

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

Course Designer

- 1. Mrs.R.Panneerselvi, AssistantProfessor
- 2. Mrs.C.R.Parvathy, AssistantProfessor

COURSE	COURSE NAME	CATEGORY	L	Т	Р	CREDITS
NUMBER	INTRODUCTION TO	THEORY	_	_	_	5
MTH1623	ALGORITHMS					-

- > To introduce the modern study of computer algorithms
- > Analyze the asymptotic performance of algorithms.

Course Outcomes

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

CO	СО	Knowledg
Number	Statement	e Level
CO1	Define Mathematical foundations	K2
CO2	Apply important algorithmic design paradigms and methods of analysis.	K3
CO3	Demonstrate a familiarity with major algorithms and data structures	K4
CO4	Apply the concept of binary tree find the maximum and minimum points	K5
CO5	Advanced algorithms for research	K5

Mapping with Programme Outcomes

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

ALC – SEMESTER IV

INTRODUCTION TO ALGORITHMS (MTH1623)

UNIT I

Mathematical Foundations: Introduction- Growth of Functions- Asymptotic notation- Standard notations and common functions- Summations- Summation formulas and properties- Bounding Summations- Recurrences- The substitution method- The iteration method- The master method- Proof of the master theorem.

UNIT II

Sorting and Order Statistics: Introduction- Heapsort- Heaps- Maintaining the heap property-Building a heap- The heapsort algorithm- Priority queues- Quicksort- Description of quicksort-Performance of quicksort- Randomized versions of quicksort-Analysis of quicksort.

UNIT III

Data Structures: Introduction- Elementary data structures- Stacks and queues- Linked lists-Implementing pointers and objects- Representing rooted trees- Hash Tables- Direct-address tables- hash tables- Hash functions- Open addressing.

UNIT IV

Binary Search Trees: What is a binary search tree?- Querying a binary search tree- Insertion and deletion- Randomly built binary search tree- Red-Black Trees- Properties of red-black trees-Rotations- Insertion- Deletion- Augmenting Data Structures- Dynamic order statistics- How to augment a data structure- Interval trees.

UNIT V

Advanced Data Structures: B- Trees- Definition- Basic operations of B-Trees- Deleting a key from a B-tree- Binomial Heaps- Binomial trees and binomial heaps- Operations on binomial heaps- Fibonacci heaps- Structure of Fibonacci heaps- Mergeable-heap operations- Decreasing a key and deleting a node- Bounding the maximum degree.

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication		
	Thomas H.Cormen,	Introduction	Prentice Hall	2001		
1.	Charles E.Leiserson		Nerra Della			
	Ronald L.Rivest		New Delhi			
	Unit I : Sections 2.1-2.2, Sections 3.1-3.2, Sections 4.1-					
	4.4 Unit II : Sections 7.1-7.5, Sections 8.1-8.4					
	Unit III: Sections 11.1-11.4, Sections 12.1-12.4					
	Unit IV: Sections 13.1-13.4, Sections 14.1-14.4, Sections 15.1-15.3					
	Unit V : Sections 19.1-19.3, Sections 20.1-20.2, Sections21.1-21.4					

Reference Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	CormenThom	Introduction to Algorithms	Prentice,	1990
	s.H,Leiserson		Hall of	
	Charles.E,		India,	
	And			
	RivestRonald.		NewDelhı	
	L			

Pedagogy

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

Course Designer

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