PSGR Krishnammal College for Women

DEPARTMENT OF MATHEMATICS(PG)

CHOICE BASED CREDIT SYSTEM &

OUTCOME BASED EDUCATION SYLLABUS

MASTER OF SCIENCE (M.Sc)

MATHEMATICS

2020– 2022 (BATCH)

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.

PO2 : 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.

DEPARTMENT OF MATHEMATICS(PG)
CHOICE BASED CREDIT SYSTEM & OUTCOME BASED EDUCATION
SYLLABUS & SCHEME OF EXAMINATION

MASTER OF MATHEMATICS
2020- 2021

Programme & Branch M . S c –Mathematics

Scheme of Examination
(Applicable to students admitted during the academic year *2020- 2021*onwards)

Semester	Part	Subject Code	Title of the paper	Type	Hours per Week	Contact Hrs	Tutorial Hrs	Duration of Exam	Examination Marks			Credits
									CA	ESE	Total	
I	III	MTH2001	Algebra	Core	6	86	4	3	40	60	100	4
		MTH2002	Real Analysis	Core	6	86	4	3	40	60	100	4
		MTH2003	Ordinary Differential Equations	Core	6	86	4	3	40	60	100	4
		MTH2004	Mathematical Statistics	Core	6	86	4	3	40	60	100	4
		MTH20E1	**Elective I:** Financial Mathematics (OR) **Elective II:** Graph Theory	Elective	6	86	4	3	40	60	100	4
II	III	MTH2005	Number Theory	Core	5	71	4	3	40	60	100	4
		MTH2006	Lebesgue Measure Theory	Core	5	71	4	3	40	60	100	4
		MTH2007	Partial Differential Equations	Core	5	71	4	3	40	60	100	4
		MTH2008	Mechanics	Core	6	86	4	3	40	60	100	5
		MTH20E3 MTH20E4	**Elective III:** Control theory (OR) **Elective IV:**	Elective	4	56	4	3	40	60	100	3

			Stochastic Processes									
		MCM18A3	IDC- Financial and Management Accounting	Inter disciplinary	5	75	-	3	-	100	100	3
III	III	MTH1909	Complex Analysis	Core	6	86	4	3	40	60	100	5
		MTH1910	Topology	Core	6	86	4	3	40	60	100	5
		MTH1911	Basics of Cryptography	Core	6	86	4	3	40	60	100	5
		MTH1912	Fluid Dynamics	Core	6	86	4	3	40	60	100	5
		MTH19S1	Research Methodology	Special paper	2	30	-	3	-	100	100	2
		MTH19E5 MTH19E6	**Elective V:** Mathematical Modelling (OR) **Elective VI:** Tensor Analysis	Elective	4	56	4	3	40	60	100	3
IV	III	MTH1913	Functional Analysis	Core	6	86	4	3	40	60	100	5
		MTH1914	Mathematical Methods	Core	6	86	4	3	40	60	100	5
		MTH1915	Mathematical Programming	Core	6	86	4	3	40	60	100	4
		MTH19PROJ	Project	Core	7	105	-	3	20	80	100	5
		MTH19E7 MTH19E8	**Elective VII:** Formal Languages and Automata Theory (OR) **Elective VIII:** Differential Geometry	Elective	5	71	4	3	40	60	100	3
		MTH1622 MTH1623	**ALC-** Advanced Computing Techniques (OR) ALC – Introduction to Algorithms	ALC	-	-	-	3	25	75	100	5
										Total	2200 +100	90+5

Bloom's Taxonomy based Assessment Pattern

CA I & II :

Bloom's Category	Section	Marks		Total
Remember ,Understand (K_1, K_2)	A – 5x2 marks (No Choice)	10	1 or 2 sentences	50
Apply , Analyse (K_3, K_4)	B – 4 x 5 marks (No Choice)	20	250 words	
Evaluate, Create(K_5, K_6)	C – 2 out of 3 (2x 10 marks)	20	500 words	

End Semester Examination

Bloom's Category	Section	Marks		Total
Remember ,Understand (K_1, K_2)	A – 11 out of 13 (11x2 marks)	22	1 or 2 sentences	100
Apply , Analyse (K_3, K_4)	B – 5 out of 7(6 x5 marks)	30	300 words	
Analyse, Evaluate, Create (K_4, K_5, K_6)	C – 4 out of 5, 6 compulsory (4x12 marks)	48	800 words	

Question paper pattern for ALC- CA

Bloom's Category	Section	Marks		Total
Apply , Analyse (K_3, K_4)	A – 4 out of 6(4 x 4 marks)	16	250 words	25
Analyse, Evaluate(K_4, K_5)	B – 1 out of 2(1 x 9 marks)	9	500 words	

Model and End Semester Examination

Bloom's Category	Section	Marks		Total
Apply , Analyse (K_3, K_4)	A – 5 out of 8 (1x 5 marks) (Open Choice)	25	250 words	75
Analyse, Evaluate(K_4, K_5)	B – 5 out of 8(5 x 10 marks) (Open Choice)	50	500 words	

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF CONTINUOUS INTERNAL ASSESSMENT

Theory

	CIA I	CIA II	Model Exam	Assignment/ Class Notes	Seminar	Quiz	Class Participation	Library Usage	Attendance	Max. Marks
Core / Elective	5	5	6	4	5	4	5	3	3	40
ALC		10	15	-	-	-	-	-	-	25

PROJECT

Internal Assessment: 20 Marks

Review	Mode of Evaluation	Marks	Total
I	Selection of the field of study, Topic & Literature Collection	5	20
II	Research Design and Data Collection	10	
III	Analysis & Conclusion, Preparation of rough draft	5	

External Assessment : 80 Marks

Mode of Evaluation	Marks	Total
Project Report		
Relevance of the topic to academic / society	10	60
Objectives	10	
Experimental Design	20	
Expression of Results and Discussion	20	
Viva Voce		
Presentation	10	20
Discussion	10	

QUIZ

Maximum - 20 Marks (converted to 4 marks)

RUBRICS

Assignment/ Seminar

Maximum - 20 Marks (converted to 4 marks)

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
Focus Purpose	Clear	Shows awareness	Shows little awareness	No awareness
Main idea	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea
Organisation: Overall	Well planned	Good overall organization	There is a sense of organization	No sense of organization
Content	Exceptionally well presented	Well presented	Content is sound	Not good
Style: Details and Examples	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks) – Scaled from 5 to 1

Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark
Level of Engagementin Class	Student proactively contributesto class by offering ideas and asks questions more than once per class.	Student proactively contributesto class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributeto class by offering ideas and asking no questions	Student never contributes to class by offering ideas
Listening Skills	Student listens whenothers talk, both in groups and in class. Student incorporatesor builds offof the ideas of others.	Student listens when others talk, both in groups andin class.	Student listens whenothers talk in groups and in class occasionally	Student does not listen whenothers talk,both in groups andin class.	Student does not listen whenothers talk,both in groups andin class. Student often interrupts when others speak.
Behavior	Student almost neverdisplays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.

MAPPING OF POs WITH Cos

COURSE	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
COURSE – MTH2001					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S
COURSE – MTH2002					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S
COURSE – MTH2003					
CO1	S	S	S	S	S
CO2	S	M	S	S	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	M
COURSE – MTH2004					
CO1	S	M	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	S	S	S
CO5	S	S	M	S	S

COURSE – MTH20E1					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S
COURSE – MTH20E2					
CO1	S	S	S	M	S
CO2	S	M	M	S	S
CO3	S	S	S	S	M
CO4	M	S	M	S	S
CO5	S	S	S	M	S
COURSE – MTH2005					
CO1	S	S	S	S	M
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	S	M	S	S	S
CO5	S	S	S	M	M
COURSE – MTH2006					
CO1	S	S	M	S	S
CO2	S	M	S	M	S
CO3	S	S	S	M	S
CO4	S	S	S	S	M
CO5	S	S	M	S	S
COURSE – MTH2007					
CO1	S	S	S	S	M

CO2	S	S	M	S	S
CO3	S	M	S	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S
COURSE – MTH2008					
CO1	M	S	S	S	M
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	M
COURSE – MTH20E3					
CO1	S	S	M	S	S
CO2	S	S	S	M	S
CO3	S	M	S	S	S
CO4	S	S	S	S	M
CO5	S	M	S	S	S
COURSE – MTH20E4					
CO1	S	M	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	S	S	S
CO5	S	S	M	S	S
COURSE - MTH1909					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M

CO4	S	M	S	S	M
CO5	S	S	M	S	S
COURSE - MTH1910					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S
COURSE - MTH1911					
CO1	S	S	S	S	S
CO2	S	S	S	M	S
CO3	M	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S
COURSE - MTH1912					
CO1	S	M	S	S	M
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S
COURSE - MTH19E5					
CO1	S	S	S	S	M
CO2	S	S	S	M	S
CO3	S	M	S	S	S
CO4	S	S	M	M	S
CO5	S	S	S	S	M
COURSE - MTH19E6					

CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	M	M
CO5	S	S	M	M	S
COURSE - MTH1913					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
COURSE - MTH1914					
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	M
COURSE - MTH1915					
CO1	S	S	S	M	S
CO2	S	S	S	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
COURSE - MTH19E7					
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	S	S

COURSE - MTH19E8					
CO1	M	S	S	S	M
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	M
COURSE - MTH1622					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S
COURSE - MTH1623					
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S

COURSE NUMBER MTH2001	COURSE NAME ALGEBRA	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	4

Preamble

- 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

CO Number	CO Statement	Knowledge Level
CO1	onstrate competence with the basic ideas of algebra including the concepts of direct products, finitely generated abelian groups	K2
CO2	onstrate knowledge of the structures of fields ,extension fields and finite fields	K3
CO3	eciate the significance Sylow's theorem and Galois theory	K4
CO4	pose 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	M	S
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

CORE I - SEMESTER I – ALGEBRA (MTH2001)

Unit I **(17 hrs)**

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

Unit II **(18 hrs)**

Vector spaces and modules: elementary basic concepts – linear independence and bases – dual spaces – inner product spaces – modules

Unit III **(17 hrs)**

Fields: Extension Fields - Roots of Polynomials - More about root-Elements of Galois Theory - Solvability by radicals -Finite fields

Unit IV **(17 hrs)**

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

Unit V **(17 hrs)**

Canonical Forms: A Decomposition of V: Jordan form - Rational Canonical Form- Trace and Transpose - Determinants – Hermitian - Unitary and Normal transformations –Real quadratic forms.

Text book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	I.N. Herstein	Topics in Algebra	2nd edition, John Wiley & Sons	2016
	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			

References

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

Pedagogy

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

Course Designers

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

2. Mrs. R. Meenambigai, Assistant Professor

COURSE NUMBER MTH2002	COURSE NAME REAL ANALYSIS	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	4

Preamble

- 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

CO Number	CO Statement	Knowledge Level
CO1	Describe fundamental properties of the real numbers that lead to the formal development of real analysis	K2
CO2	Comprehend rigorous arguments developing the theory underpinning real analysis	K3
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	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

CORE II – SEMESTER I - REAL ANALYSIS (MTH2002)

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 **(18 Hrs)**

Uniform convergence and Continuity - Uniform convergence and Integration - Uniform convergence and Differentiation - Equi continuous Families of Functions-The Stone-Weierstrass theorem

Unit III **(18Hrs)**

Power Series - The Exponential and Logarithmic Functions - The Trigonometric Functions – The Algebraic completeness of the complex field- Fourier series- The Gamma Functions.

Unit IV **(16 Hrs)**

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

Unit V **(16Hrs)**

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

Text Book

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

Reference Books

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

Pedagogy

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

Course Designer

1. Mrs.R.Sakthikala, Assistant Professor
2. Mrs.S.Aiswarya, Assistant Professor

COURSE NUMBER MTH2003	COURSE NAME ORDINARY DIFFERENTIAL EQUATIONS	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	4

Preamble

- 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

CO Number	CO Statement	Knowledge 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, both at ordinary points and at regular singular points	K3
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).	K5
CO5.	Construct and apply symbolic and graphical representations of functions	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE III – SEMESTER I - ORDINARY DIFFERENTIAL EQUATIONS (MTH2003)

Unit I **(16 hrs)**

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

Unit II **(16 hrs)**

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

Unit III **(17 hrs)**

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

Unit IV **(18 hrs)**

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

Unit V **(19 hrs)**

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 Publication
1.	S.G. Deo and V.Raghavendra	Ordinary differential equations and Stability theory	Tata Mc Graw hill publishing company (P) Ltd, New Delhi,	2002
	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			

References

S.No	Author	Title of Book	Publishers	Year of publication
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 MTH2004	COURSE NAME MATHEMATICAL STATISTICS	CATEGORY	L	T	P	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	K_4
CO4	Understand the basics of sampling distribution theory	K_5
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	M	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	S	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

CORE IV – SEMESTER I - MATHEMATICAL STATISTICS (MTH2004)

Unit I **(16 Hrs)**

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 **(17 Hrs)**

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

Unit III **(19 Hrs)**

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 **(17 Hrs)**

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 **(17 Hrs)**

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 : Chapter 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.	S..C.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 MTH20E1	COURSE NAME FINANICAL MATHEMATICS	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	4

Preamble

- 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

CO Number	CO Statement	Knowledge Level
CO1	Apply advanced knowledge in probability, statistics, stochastic calcul us and numerical methods for financial applications.	K2
CO2	Demonstrate a broad knowledge of the financial securities as well as practical aspects of risk management.	K3
CO3	Construct quantitative models for derivative pricing, quantitative trad ing strategies, risk management, and scenario simulations.	K4
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	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE I – SEMESTER I - FINANICAL MATHEMATICS (MTH20E1)

Unit I **(16Hrs)**

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

Unit II **(17 Hrs)**

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.

Unit III **(17 Hrs)**

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

Unit IV **(17 Hrs)**

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

Unit V **(19 Hrs)**

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

Text Book

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

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 NUMBER MTH20E2	COURSE NAME GRAPH THEORY	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	4

Preamble

- 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

CO Number	CO Statement	Knowledge 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 .	K5
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	M	S
CO2	S	M	M	S	S
CO3	S	S	S	S	M
CO4	M	S	M	S	S
CO5	S	S	S	M	S

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE II - SEMESTER I - GRAPH THEORY (MTH20E2)

Unit I **(16 hrs)**

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

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

Unit II **(16 hrs)**

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

Unit III **(18 hrs)**

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

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

Unit IV **(18 hrs)**

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 **(18 hrs)**

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 – Non hamiltonian Planar Graphs

Directed Graphs: Directed Graphs – Directed Paths – Directed Cycles.

Text book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	J.A. Bondy and U.S.R. Murty	Graph theory with applications	Elsevier Publishing Co., Inc., New York	1976
	Unit I : Chapter 1, Sections 1.1 to 1.7 & Chapter 2, Sections 2.1 to 2.4. Unit II : Chapter 3, Sections 3.1 to 3.2 & Chapter 4, Sections 4.1 to 4.2 Unit III : Chapter 5, Sections 5.1 to 5.3 & Chapter 6, Sections 6.1 to 6.2 Unit IV : Chapter 7, Sections 7.1 to 7.2 & Chapter 8, Sections 8.1 to 8.5 Unit V : Chapter 9, Sections 9.1 to 9.7 & Chapter 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 NUMBER MTH2005	COURSE NAME NUMBER THEORY	CATEGORY	L	T	P	CREDIT
		THEORY	71	4	-	4

Preamble

- 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	M
CO2.	S	S	M	M	S
CO3.	S	S	M	S	S
CO4.	S	M	S	S	S
CO5.	S	S	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

CORE V – SEMESTER II - NUMBER THEORY (MTH2005)

Unit-I **(13 Hrs)**

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 **(14 Hrs)**

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 **(16 Hrs)**

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 **(14 Hrs)**

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 Vazzana	Introduction to Number Theory	Chapman & Hall/CRC	2009
	UNIT – I Chapter III : Sections 3.1 to 3.8 UNIT – II Chapter V: Sections 5.1 to5.5. UNIT – III Chapter VI & VII: Sections 6.1 to 6.4. 7.2 -7.3 and Chapter VIII: Sections 8.1 to 8.4 UNIT – IV Chapter IX : Sections 9.1 to 9.7 UNIT – V Chapter X : Sections 10.1 to 10.7			

Reference Books

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

Pedagogy

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

Course Designers

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

2.Mrs.K. Kavitha, Assistant Professor

COURSE NUMBER MTH2006	COURSE NAME LEBESGUE MEASURE THEORY	CATEGORY	L	T	P	CREDIT
		THEORY	71	4	-	4

Preamble

- 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

CO Number	CO Statement	Knowledge 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 Lebesgue integral.	K2
CO2	Derives the concepts of Borel sets, measurable functions, differentiation of monotone functions	K3
CO3	Analyse about the little wood's theorem, integral of a non-negative function, functions of bounded variation	K4
CO4	Construct a clear idea about convergence in measure, differentiation of an integral, absolute continuity and convex functions	K5
CO5	Apply the theory of the course to solve a variety of problems at an appropriate level of difficulty	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE VI – SEMESTER II - LEBESGUE MEASURE THEORY (MTH2006)

Unit I **(14Hrs)**

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 **(14Hrs)**

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

Unit III **(15Hrs)**

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 **(14 Hrs)**

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

Unit V **(14 Hrs)**

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

Text Book

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 – Chapter 4– Sections: 1-4 UNIT: IV – Chapter 5– Sections: 1-5 UNIT: V – Chapter 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

COURSE NUMBER MTH2007	COURSE NAME PARTIAL DIFFERENTIAL EQUATIONS	CATEGORY	L	T	P	CREDIT
		THEORY	71	4	-	4

Preamble

- 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 Number	CO Statement	Knowledge 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.	K3
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	M
CO2	S	S	M	S	S
CO3	S	M	S	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

CORE VII – SEMESTER II - PARTIAL DIFFERENTIAL EQUATIONS (MTH2007)

Unit I **(15 Hrs)**

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

Unit II **(14 Hrs)**

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 **(14 Hrs)**

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

Unit IV **(14 Hrs)**

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 **(14 Hrs)**

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

Text Book

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

Reference Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Raisinghania.M D	Ordinary and partial differential equation	S.Chand Company, 9th edition	2005
2.	Vairamanickam K and Etal	Transforma and partial differential equations	Scitech Publications India Pvt Ltd, 2nd 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	Tata Mc Graw Hill Education Private Limited	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 NUMBER MTH2008	COURSE NAME MECHANICS	CATEGORY	L	T	P	CREDIT
		THEORY	86	4	-	5

Preamble

- 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

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the knowledge of core principles in mechanics	K2
CO2	Interpret complex and difficult problems of classical dynamics in a systematic way	K3
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	K5
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	M	S	S	S	M
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

CORE VIII – SEMESTER II - MECHANICS (MTH2008)

UNIT I **(18 hrs)**

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

UNIT II **(17 hrs)**

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

UNIT III **(17 hrs)**

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

UNIT IV **(17 hrs)**

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

UNIT V **(17 hrs)**

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

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Donald T.Greenwood	Classical Dynamics	Dover Publications	1997
	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 : Chapter 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, 1st 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

COURSE NUMBER MTH20E3	COURSE NAME CONTROL THEORY	CATEGORY	L	T	P	CREDIT
		THEORY	56	4	-	3

Preamble

- 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.	K3
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	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE III – SEMESTER II - CONTROL THEORY (MTH20E3)

Unit I **(12 Hrs)**

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

Unit II **(11 Hrs)**

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

Unit III **(11 Hrs)**

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

Unit IV **(11 Hrs)**

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

Unit V **(11 Hrs)**

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

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	K.Balachandran and J.P.Dauer	Elements of Control Theory	Narosa, New Delhi	2012
	Unit I : Chapter 2- Sections : 2.1-2.2 Unit II : Chapter 3- 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- Sections : 6.1- 6.3			

Reference Books

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

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 NUMBER MTH20E4	COURSE NAME STOCHASTIC PROCESSES	CATEGORY	L	T	P	CREDIT
		THEORY	56	4	-	3

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 Stochastic process, Markov chains,	K_2
CO2	Apply the concepts in	K_3
CO3	Identify the type of the distribution	K_4
CO4	Understand the basics of sampling distribution theory	K_5
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	M	S	S	S
CO2	S	S	S	M	S
CO3	S	S	M	S	S
CO4	M	S	S	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE IV – SEMESTER II - STOCHASTIC PROCESSES (MTH20E4)

UNIT I **(12 Hrs)**

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

UNIT II **(11 Hrs)**

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 **(11 Hrs)**

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 **(11 Hrs)**

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 **(11 Hrs)**

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 book

S. No	Author	Title of the book	Publishers	Year of Publication
1	Samuel Karlin and Howard M. Taylor	A First Course in Stochastic Processes	Academic Press, New york, Second edition.	
	Unit I : Chapter : 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

COURSE NUMBER MTH1909	COURSE NAME COMPLEX ANALYSIS	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	5

Preamble

- To present students the elements and importance of the Complexanalysis.
- To define and recognize the basic properties of the complexnumbers.
- To enable the students to the differentiability of complex functions and itsrelated theorems.

CourseOutcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Describe fundamental properties of the complex numbers that lead to the development of complex analysis	K2
CO2	Evaluate line integrals, curve integrals, singularities and determine the values of integrals using residues.	K3
CO3	Apply and understand about limits and to know how they are used in series and problems	K4
CO4	Analyze functions of complex variable in terms of continuity, differentiability and analyticity. Apply Cauchy-Riemann equationsand harmonic functions to solve problems	K5
CO5	Comprehend rigorous arguments developing the theory underpinning complex analysis	K5

Mapping with ProgrammeOutcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE IX - SEMESTER III - COMPLEX ANALYSIS (MTH1909)

Unit I **(16 Hrs)**

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 **(17 Hrs)**

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 **(17 Hrs)**

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 **(17 Hrs)**

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

Unit V **(19 Hrs)**

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.

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: Chapter - 4 Sections 5.1-5.3,6.1-6.3 Unit IV: Chapter - 5 Sections 1.1-1.3,2.1-2.3 Unit V : Chapter - 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, Group discussion, Seminar, Quiz

CourseDesigner

1. Mrs. K. Sharmilaa, AssistantProfessor

2. Mrs. R. Sakthikala, AssistantProfessor

COURSE NUMBER MTH1910	COURSE NAME TOPOLOGY	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	5

Preamble

- Students will learn the fundamental concepts of point-settopology.
- Introduce students to the concepts of open and closed sets abstractly, not necessarily only on the real lineapproach.
- Provide the awareness of tools to students to carrying out advanced research work inpure mathematics

CourseOutcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Define and illustrate the concept of topological spaces and continuous functions, concept of product topology and quotient topology	K2
CO2	Identify the concepts of distance between two sets, connectedness, denseness, compactness and separation axioms.	K3
CO3	Analyze the concepts to read and write theorem proofs in topology	K4
CO4	Ability to determine that a given point in a topological space is either a limit point of not for a given subset of a topologicalspace.	K5
CO5	Apply theorem proofs to do variety of examples and counter examples in topology	K5

Mapping with ProgrammeOutcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE X – SEMESTER III - TOPOLOGY (MTH1910)

UnitI **(18 Hrs)**

Topological Spaces - Basis for a Topology - The Order Topology - Closed Sets and Limit Points - Continuous Functions - Product Topology - Metric Topology.

UnitII **(17 Hrs)**

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

UnitIII **(15 Hrs)**

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

UnitIV **(17 Hrs)**

The Tychonoff Theorem - Completely Regular spaces - The Stone-CechCompactification.

UnitV **(19 Hrs)**

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

Text Book

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

Course Designer

1. Mrs. C.R. Parvathy, AssistantProfessor

2. Mrs. M. Deepa, AssistantProfessor

COURSE NUMBER MTH1911	COURSE NAME BASICS OF CRYPTOGRAPHY	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	5

Preamble

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

Course Outcomes

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

CO No.	CO Statement	Knowledge level
CO1	Understand the basic concept of Cryptography and Network Security, their mathematical models.	K_2
CO2	Understand mathematical foundation required for various cryptographic Algorithms. Identify and classify computer and security threats	K_3
CO3	Describe and analyze existing authentication protocols for two party communications.	K_4
CO4	Examine the issues and structure of Authentication Service and Electronic Mail Security, web security and IP security.	K_5
CO5	Develop a security model to prevent, detect and recover from attacks.	K_6

Mapping with Programme Outcomes

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

S- Strong, M- Medium, L-Low

Syllabus

CORE XI – SEMESTER III - BASICS OF CRYPTOGRAPHY (MTH1911)

Unit I **(19 hrs)**

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 **(19 hrs)**

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 **(18 hrs)**

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 **(15 hrs)**

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 **(15 hrs)**

Virus: Viruses and Related threats, Virus Countermeasure

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

Text Books

S.No	Author	Title of the book	Publishers	Year of Publication
1	Dr.Michael E. Whitman Herbers J.Mattord	Principles and Practices of Information Security	Course Technology Cengage Learning	2009
Unit I : Chapter 1 : Upto SSDLC & Chapter 2 Chapter 8 : Upto Cryptographic Tools				
2	William Stallings	Cryptography and Network Security	Pearson Education	4th Edition, 2006
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, New Delhi	2009
2	Pachghare V.K.	Cryptography and Information Security	PHI Learning Pvt Ltd, New Delhi	2009
3	Boris Ryabko, AndreyFionov	Basics of Contemporary Cryptography for IT practitioners, series on coding theory and cryptology – Vol I	World Scientific Publishing Co.Re.Ltd, Singapore	2005

Pedagogy

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

Course Designer

1. Mrs. R.Panneerselvi, AssistantProfessor
2. MrsK.Kavitha, AssistantProfessor

COURSE NUMBER MTH1912	COURSE NAME FLUID DYNAMICS	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	5

Preamble

- 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 relateddisciplines.
- To develop the problem-solving skills essential to fluid dynamics in practicalapplications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental knowledge of fluids and its properties	K2
CO2	Describe the concepts and equations of fluid dynamics	K3
CO3	Apply thermodynamic control volume concepts in fluid dynamics for applications that include momentum, mass and energy balances	K4
CO4	Analyze the approximate solutions of the Navier-Stokes equation	K5
CO5	Appreciate the role of fluid dynamics in day-to-day life	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE XII – SEMESTER III - FLUID DYNAMICS (MTH1912)

Unit-I **(16 hrs)**

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.

Unit-II **(18 hrs)**

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 **(18 hrs)**

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 **(17 hrs)**

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

Unit-V **(17 hrs)**

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 equation and its solution inseries.

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	L.M. Milne Thomson Units I & II	Theoretical Hydro Dynamics	Dover Publications, New edition	2011
2.	N. Curle and H.J. Davies Units III , IV &V	Modern Fluid Dynamics Volume I	D.VanNostrand Company Ltd, London	1968
	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 Chapter VI : 6.1 - 6.3.1. Omit6.2.2			

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

Pedagogy

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

Course Designers

1. Mrs.R.Panneerselvi, AssistantProfessor
2. Mrs.S.Aiswarya, AssistantProfessor

Syllabus

SEMESTER III – SPECIAL PAPER

RESEARCH METHODOLOGY (MTH19S1)

Credits : 2 **Total duration : 28 Hrs**

Objective

To motivate the students in Research Oriented Topics.

Unit I **(5 Hrs)**

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 **(6 Hrs)**

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 **(6 Hrs)**

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

Unit IV **(6 Hrs)**

PostScript 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
	Unit I: Chapters : 1,14			
2.	H.Kopka ar P.W.Daly	A Guide to Latex	Fourth Editio Addition Wile London	2003
	Unit II : Chapter 2 & 3 Unit III : Chapter 4 & 5 Unit IV : Chapters 10 & 12			
3.	Unit V https://www.glos.ac.uk/docs/download/Research/handbook-of-principles-and-procedures.pdf			

References

S. No	Author	Title of the book	Publishers	Year of Publication
1.	S.D.Sharma	A Text Book of Scientific and Technical Communication Writing f Engineers and Professionals	Sarup& Sons, New Delhi	2007
2.	George A. Gratzer	Math Into LaTeX: An Introduction to LaTeX an AMS-LaTex	Springer-Verlag	1996
3.	Stefan Kottwitz	LaTeX Beginner's Guide	Packt Publishing 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.Aulisio, Robert M.Arnold		
6.		Research Regulatory Compliance 1st Edition (Mark Suckow, Bill Yates eBook ISBN: 9780124200654)		
7.		Recent research ethics polic from Government of India.		

Pedagogy

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

Course Designers

1. Dr. S.Aiswarya
2. Mrs. R. Meenambigai

COURSE NUMBER MTH19E5	COURSENAME MATHEMATICAL MODELLING	CATEGORY	L	T	P	CREDITS
		THEORY	56	4	-	3

Preamble

- 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 Outcomes

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

CO No	CO Statement	Knowledge Level
CO1	Understand the importance of Mathematical modeling in the real world	K2
CO2	Assess and articulate what type of modeling techniques are appropriate for a given physical system	K3
CO3	Construct a mathematical model of a given physical system and analyze it, make predictions	K4
CO4	Compose the findings from the methods applied for the problem	K5
CO5	Formulate, analyze and simulate mathematical models	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE V – SEMESTER III - MATHEMATICAL MODELLING (MTH19E5)

Unit-I **(11 hrs)**

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 **(11 hrs)**

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 **(11 hrs)**

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 **(12 hrs)**

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 **(11 hrs)**

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

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	J.N. Kapoor	Mathematical Modelling	Willey Eastern Limited	Reprint 2000
	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			

References

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

Pedagogy

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

Course Designers

1. Mrs. R. Panneerselvi, AssistantProfessor
2. Mrs. D. Narmadha, AssistantProfessor

COURSE NUMBER MTH19E6	COURSE NAME TENSOR ANALYSIS	CATEGORY	L	T	P	CREDITS
		THEORY	56	4	-	3

Preamble

- 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 Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand concept of tensor variables and difference from scalar or vector variables.	K2
CO2	Derive base vectors, metric tensors and strain tensors in an arbitrary coordinate system.	K3
CO3	Investigate the Christoffel symbols which provide a concrete representation of the connection of (pseudo-)Riemannian geometry in terms of coordinates on the manifold.	K4
CO4	Apply Riemannan-Christoffel tensor to problems of differential geometry, electrodynamics and relativity.	K5
CO5	Interpret tensor representation from interdisciplinary areas.	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

SEMESTER IV – ELECTIVE VI

TENSOR ANALYSIS (MTH19E6)

Unit I **(12 Hrs)**

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

Unit II **(11 Hrs)**

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 **(11 Hrs)**

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.

Text Book

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

Reference Books

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

Pedagogy

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

Course Designer

1. Mrs.S.Aiswarya, Asst.Professor

2. Mrs.R.Panneerselvi, Asst.Professor

COURSE NUMBER MTH1913	COURSE NAME FUNCTIONAL ANALYSIS	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	5

Preamble

- 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 Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Describe properties of normed linear spaces and construct examples of such spaces	K2
CO2	Apply basic theoretical techniques to analyze linear functionals and operators on Banach and Hilbert spaces.	K3
CO3	Apply orthonormality to Fourier series expansions of functions	K4
CO4	Apply theorems to do problems	K5

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE PAPER XIII - SEMESTER IV - FUNCTIONAL ANALYSIS (MTH1913)

Unit I **(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 **(17 Hrs)**

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

Unit III **(17 Hrs)**

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

Unit IV **(16 Hrs)**

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

Unit V **(18 Hrs)**

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

S. No	Author	Title of the book	Publishers	Year of Publication
1.	G.F. Simmons	Introduction to Topology and Modern Analysis	Tata McGraw -Hill company	1983
	Unit I :Sections : 46-50 Unit II :Sections : 51 -54 Unit III :Sections : 55 -59 Unit IV :Sections : 60 -63 Unit V :Sections : 64 -68			

References

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, 1st Edition
4.	L.A. Lustenik and V.J. Sobolev	Elements of Functional Analysis	Hindustan Publishing Corporation, New Delhi	1971, 1st Edition

Pedagogy

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

Course Designer

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

2. Mrs.M.Deepa, AssistantProfessor

COURSE NUMBER MTH1914	COURSE NAME MATHEMATICAL METHODS	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	5

Preamble

- 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 Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge of various mathematical concepts and techniques requiredforsuccessfulapplicationofmathematicsinphysicsandrelated sciences	K2
CO2	Apply various transforms and integral equations to solve multidisciplinary application problems	K3
CO3	Recognize 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
CO4	Demonstrate the ability to present their results	K5
CO5	Develop strategies using mathematical methods to solve real world problems	K6

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CORE PAPER XIV - SEMESTER IV - MATHEMATICAL METHODS (MTH1914)

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 **(17 hrs)**

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 **(15 hrs)**

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 **(18hrs)**

Applicationofintegralequationtoordinarydifferentialequation-Initialvalueproblems - Boundary value problems - Singular integral equations - Abel integral equation.

Unit-V **(19 hrs)**

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.

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1.	Ian N. Sneddon Unit I and II	The use of Integral Transforms	McGraw Hill Book Company	1979
2.	Ram P. Kanwal Unit III and IV	Linear Integral Equations : Theory and Technique	Academic Press, New York	2012
3.	L. Elsgolts UNIT V	Differential equations and calculus of variations	University Press of the Pacific	2003
	UnitI : Chapter 2: 2.4 – 2.7, 2.9–2.10, 2.16 (2.16.1(a,b,c)), (2.16.2(a,b)) Unit II : Chapter 5: 5.2 – 5.4, 5.6 – 5.7,5.10(5.10.1,5.10.2) 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 : Chapter 6: 6.1 –6.7			

Reference Books

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

Pedagogy

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

Course Designers

1. Mrs. R.Panneerselvi, AssistantProfessor
2. Mrs. K.Sharmilaa, AssistantProfessor

COURSE NUMBER MTH1915	COURSE NAME MATHEMATICAL PROGRAMMING	CATEGORY	L	T	P	CREDITS
		THEORY	86	4	-	4

Preamble

- 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 Outcomes

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

CO No.	CO Statement	Knowledge level
CO1	Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry	K_2
CO2	Know how to use variables for formulating complex mathematical models in management science, industrial engineering and Transportation science and in real life.	K_3
CO3	Analyze a managerial decision problem and formulate into a mathematical model	K_4
CO4	To design, improve and operate complex systems in the best possible way	K_5, K_6

Mapping with Programme Outcomes

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

S- Strong, M- Medium, L-Low

Syllabus

ELECTIVE VII- SEMESTER IV

MATHEMATICAL PROGRAMMING (MTH1915)

Unit I: **(16 hrs)**

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: **(17 hrs)**

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 – QuadraticProgramming.

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, P.K.Gupta, Man Mohan	Operations Research	Sultan Chand and Sons Publishers	2005
2	J.K. Sharma	Operations Research	Macmillan India Limited	2007
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

1. Ms.R.Panneerselvi,Asst.Professor
2. MsK.Kavitha, Asst.Professor

PROJECT & VIVA VOCE(MTH19PROJ)

Credits:5 **Hours Per Week: 7Hrs**

Maximum Marks: 100

Internal Evaluation

I Review – Selection of the field of study, Topic & research design	- 5 Marks II
Review – Literature Collection & Data Collection	- 5 Marks
III Review – Analysis & Conclusion Preparation of rough draft	- 10Marks
Total	- 20 Marks

End Semester Examination

Evaluation of the project	- 60 Marks
Viva Voce	- 20 Marks
Total	- 80 Marks
TOTAL	- 100 Marks

COURSE NUMBER MTH19E7	COURSE NAME - FORMAL LANGUAGES AND AUTOMATA THEORY	Category	L	T	P	Credits
		THEORY	71	4	-	3

Preamble

- 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

CO Number	CO Statement	Knowledge Level
CO1	understand basic concepts in Lattices , formal language and automata theory	K2
CO2	demonstrate abstract models of computing, including deterministic (DFA), non-deterministic (NFA), Push Down Automata(PDA)	K3
CO3	relate practical problems to languages and automata	K4
CO4	Design grammars and recognizers for different formal languages	K5
CO5	formalize the structure of a given formal language using regular expressions and context - free grammars	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6
C01.	S	S	S	S	S	S
CO2.	S	S	S	S	S	S
CO3.	S	S	S	S	S	S
CO4.	S	S	S	S	S	S
CO5.	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE VII - SEMESTER IV
FORMAL LANGUAGES AND AUTOMATA THEORY (MTH19E7)

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 **(10 hrs)**

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 ε Transitions -Regular Expressions - Finite Automata and Regular Expressions – Applications of Regular Expressions – Algebraic Laws for Regular Expressions

UNIT IV **(15 hrs)**

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 **(16 hrs)**

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.

Text Books

S. No	Author	Title of the book	Publishers	Year of Publication
1	J.P.Tremblay and R.P.Manohar	Discrete Mathematical Structures with Applications to Computer Science	McGraw Hill Publishing Company	reprint 2016
	UNIT I : Chapter 4 Section: 4.1.1 - 4.4.2 **UNIT II** : Chapter 3 Section: 3.3.1 – 3.3.3			
2	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman	Introduction to Automata Theory, Languages, and Computation	Pearson Education, 2nd Edition	reprint 2005
	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 with Graph Theory and Combinatorics	Tata Mcgraw-Hill publishing company Limited	2008
2	Dr. M.K. Venkataraman, Dr. N. Sridharan and N. Chandrasekaran	Discrete Mathematics	First edition Reprint, The National Publishing company, Chennai	2003
3	Peter Linz	Introduction toFormal Language &Automata	Jones & Bartlett Learning, 5th edition	2012
4	T. Santha and P. Radha	Discrete mathematics for Computer Science and Applications	Kalaikathir Publications	2003
5	John Truss	Discrete mathematics for computer Scientists	Pearson Education Ltd, Second edition	2001

NOTE:
Question paper setters to confine to the above text books only.

Pedagogy
Chalk and Talk, Seminar, Group discussion, Numerical Exercises, Quiz.

Course Designers:

1. Ms.J. Rejula Mercy, AssistantProfessor
2. Mrs. C.R. Parvathy, AssistantProfessor

COURSE NUMBER MTH19E8	COURSE NAME DIFFERENTIAL GEOMETRY	CATEGORY	L	T	P	CREDITS
		THEORY	71	4	-	3

Preamble

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

Course Outcomes

Upon the successful completion of the course students

Mapping with Course Outcomes

CO Number	CO Statement	Knowledge Level
CO1	Make clear and concise arguments involving basic notions and constructions of 2-dimensional Riemannian geometry, curves and torsion.	K2
CO2	Identification of important types of curves in surfaces, including principal curves, asymptotic curves and geodesics.	K3
CO3	Enumerate some standard examples in geometry, such as surfaces of constant Gaussian curvature, compact and non -compact surfaces, and surfaces of revolution.	K4
CO4	Analyze Gaussian and mean curvatures using variety of methods including patch computations, direct calculation of the shape operator	K5
CO5	Articulate connections between geometry and other disciplines, possibly including topology, algebra, analysis, or applied mathematics.	K5

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

ELECTIVE VIII - SEMESTER IV

DIFFERENTIAL GEOMETRY (MTH19E8)

UNITI **(14 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.

UNITII **(15Hrs)**

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

UNITIII **(14 Hrs)**

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

UNITIV **(14Hrs)**

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.

UNITV **(14 Hrs)**

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.

Text Book

S. No	Author	Title of the book	Publishers	Year of Publication
1.	T.J. Willmore	An Introduction to Differential Geometry	Oxford University Press	1986
	UNIT – I Chapter I : Sections 1 to 9. UNIT – II Chapter II: Sections 1 to 9. UNIT – III Chapter II: Sections 10 to 18. UNIT – IV Chapter III: Sections 1 to 8. UNIT – V Chapter IV : Sections 1 to 8			

Reference Books

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

Pedagogy

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

Course Designers:

1. Mrs.C.R.Parvathy, AssistantProfessor
2. Mrs.S.Aiswarya, AssistantProfessor

COURSE NUMBER MTH1622	COURSE NAME ADVANCED COMPUTING TECHNIQUES	CATEGORY	L	T	P	CREDITS
		THEORY	-	-	-	5

Preamble

- 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

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

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

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 Unit II & III	John Wiley & Sons, INC	2006
2.	George .J. Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic Unit I	PrenticeHall	2000
3.	John Truss	Discrete mathematics for computer Scientists Unit IV & V	Pearson Education Ltd, Second edition	2001

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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 NUMBER MTH1623	COURSE NAME INTRODUCTION TO ALGORITHMS	CATEGORY	L	T	P	CREDITS
		THEORY	-	-	-	5

Preamble

- 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 Number	CO Statement	Knowledge 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	M	S
CO2	S	S	S	S	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

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
1.	Thomas H.Cormen, Charles E.Leiserson Ronald L.Rivest	Introduction to Algorithms	Prentice Hall of India, New Delhi	2001
	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, Sections15.1-15.3 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.	CormenThoms. H,LeisersonCharles.E, And RivestRonald. L	Introduction to Algorithms	Prentice, Hall of India, NewDelhi	1990

Pedagogy

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

Course Designer

1. Mrs.R.Panneerselvi, AssistantProfessor

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