# Periyar Maniammai University

(UNDER SEC.3 OF THE UGC ACT.1956) Periyar Nagar, Vallam, Thanjavur – 613403

# Department of Mathematics M.Sc Mathematics – Curriculum (From 2014-15 onwards)

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
	YMA 101	Groups and Rings	5	1	0	6
	YMA 102	Analysis-I	5	1	0	6
I	YMA 103	Differential Equations	5	1	0	6
	YMA 104	Discrete Mathematics	5	1	0	6
	YMA1E*	One among the list of Electives (1E)	5	1	0	6
	YMA10	Open Elective	3	0	0	3
						33

# \* List of Electives (1E)

<b>Elective Code</b>	Course Title	L	T	P	С
01	Graph Theory	5	1	0	6
02	Coding Theory	5	1	0	6
03	Mathematical Logic	5	1	0	6

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
	YMA 201	Linear Algebra	5	1	0	6
	YMA 202	Analysis-II	5	1	0	6
	YMA 203	Differential Geometry	5	1	0	6
II	YMA 204	Operations Research	5	1	0	6
	YMA2E*	One among the list of Electives (2 E)	5	1	0	6
	YMA2O	Open Elective	5	1	0	6
						36

# \* List of Electives (2E)

<b>Elective Code</b>	Course Title	L	T	P	С
01	Algebraic Number Theory	5	1	0	6
02	Data structures and Algorithms	5	1	0	6
03	Fuzzy sets and fuzzy logic	5	1	0	6

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
	YMA 301	Field Theory	5	1	0	6
	YMA 302	Topology	5	1	0	6
	YMA 303	Measure Theory	5	1	0	6
III	YMA 304	Mathematical Statistics	5	1	0	6
	YMA3E*	One among the list of Electives (3 E)	5	1	0	6
	YMA3O	Open Elective	3	0	0	3
						33

# \* List of Electives (3E)

<b>Elective Code</b>	Course Title	L	T	P	C
01	Analytical Number Theory	5	1	0	6
02	Numerical Methods	5	1	0	6
03	Commutative Algebra	5	1	0	6

Semester	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
	YMA 401	Complex Analysis	5	1	0	6
	YMA 402	Functional Analysis	5	1	0	6
IV	YMA 403	Stochastic Processes	5	1	0	6
		Open Elective	2			2
		Project work	12			12
						32

**Total Number of Credits**: 134

# \* List of Open Electives (O)

<b>Elective Code</b>	Course Title	L	T	P	С
01	Mathematics for Competitive Examinations I	3	0	0	3
02	Mathematics for Competitive Examinations II	3	0	0	3
03	Mathematics for Competitive Examinations III	3	0	0	3
04	Mathematics for Competitive Examinations IV	3	0	0	3

# Semester I

COURSE CODE		CODE	COURSE NAME	L	Т	P	С					
YMA101			GROUPS AND RINGS	5	1	0	6					
С	P	A										
6	0	0		L		L 7		L T	L T	LT	P	Н
				5	1	0	6					
PRI	EREQU	ISITE: B	asic concepts of sets, groups and rings									
COI	JRSE O	UTCOME	S:									
Cou	rse outco	omes:		Doma	in	Level						
CO			<b>plain</b> Subgroups, Normal subgroups and Quotient ge's Theorem.	Cognitive Remembe Understan								
CO			<b>Dlain</b> Homomorphism Theorems, Isomorphism	Cognitive		Remembering						
		-	omorphisms Theorems, Cayley's theorem.	Underst		_						
		•	sups, Another Counting principle.									
CO.	3: Defin	e and Ex	plain Sylow's Theorems and their simple	Cogni	tive	Remem	bering					
			rect Products: External and Internal, Finite			Unders	tanding					
		an Groups										
CO <sub>4</sub>	4: Defin	e and Ex	plain Rings, Subrings, Ideals, Factor Rings,	Cognitive Rememb		bering						
	Homo	morphism	and Integral Domains. Maximal and prime			Unders	tanding					
	ideals	. The field	of Quotients of an integral domain.									
CO		_	lain Euclidean Ring, A Particular Euclidean	Cognitive Remember								
			l Ring, and Polynomial over the Rational Field,			Unders	tanding					
		mial Ring	s over Commutative Rings.									
UNI	TI						18					

Theorem.		
UNIT II		18
Homomorphis	m Theorems, Isomorphism Theorems, Automorphisms Theorems, Cayle	ey's
theorem. Perm	utation groups, Another Counting principle.	
UNIT III		18
Sylow's Theor	rems and their simple applications, Direct Products: External and Intern	nal, Finit
Abelian Group	98.	
UNIT IV		18
Rings, Subring	gs, Ideals, Factor Rings, Homomorphism, Integral Domains. Maximal and pri	ime
ideals. The fiel	ld of Quotients of an integral domain.	
	· E	
UNIT V		18
Euclidean Ring	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Ratio	
Euclidean Ring		
Euclidean Ring	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.	
Euclidean Ring Polynomial Ring LECTURE 75	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.	onal Field
Euclidean Ring Polynomial Ring LECTURE 75 TEXTBOOK	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL  15  90	onal Field
Euclidean Ring Polynomial Ring LECTURE 75 TEXTBOOK 1. Herstein, I.N	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL 15  Topics in Algebra", Willey Eastern 1975.	onal Field
Euclidean Ring Polynomial Ring LECTURE 75 TEXTBOOK 1. Herstein, I.N Unit I - Char	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL  15  T., "Topics in Algebra", Willey Eastern 1975. pter 2 (Section 2.1 - 2.6)	onal Field
Euclidean Ring Polynomial Ring LECTURE 75 TEXTBOOK 1. Herstein, I.N Unit I - Char Unit II - Char	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL 15  N., "Topics in Algebra", Willey Eastern 1975. pter 2 (Section 2.1 - 2.6) apter 2 (Section 2.7 - 2.11)	onal Field
Euclidean Ring Polynomial Ring LECTURE 75 TEXTBOOK 1. Herstein, I.N Unit I - Char Unit II - Char Unit III - Char	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL  15  N., "Topics in Algebra", Willey Eastern 1975. pter 2 (Section 2.1 - 2.6) apter 2 (Section 2.7 - 2.11) napter 2 (Section 2.12 - 2.14)	onal Field
Euclidean Ring Polynomial Ring Polynomial Ring LECTURE 75 TEXTBOOK  1. Herstein, I.N Unit I - Cha Unit II - Cha Unit III - Cha Unit IV - Ch	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL  15  N., "Topics in Algebra", Willey Eastern 1975. pter 2 (Section 2.1 - 2.6) apter 2 (Section 2.7 - 2.11) hapter 2 (Section 2.12 - 2.14) hapter 3 (Section 3.1 - 3.6)	onal Field
Euclidean Ring Polynomial Ring Polynomial Ring IECTURE 75 TEXTBOOK  1. Herstein, I.N Unit I - Char Unit II - Char Unit III - Char Unit IV - Char Unit IV - Char Unit V - Char Unit V - Char	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL 15  N., "Topics in Algebra", Willey Eastern 1975. pter 2 (Section 2.1 - 2.6) apter 2 (Section 2.7 - 2.11) hapter 2 (Section 2.12 - 2.14) hapter 3 (Section 3.1 - 3.6) apter 3 (Section 3.7 - 3.11)	onal Field
Euclidean Ring Polynomial Ring Polynomial Ring LECTURE 75 TEXTBOOK  1. Herstein, I.N Unit I - Cha Unit II - Cha Unit III - Cha Unit IV - Cha Unit V - Cha REFERENCES	g, A Particular Euclidean Ring, Polynomial Ring, Polynomial over the Rationgs over Commutative Rings.  TUTORIAL 15  N., "Topics in Algebra", Willey Eastern 1975. pter 2 (Section 2.1 - 2.6) apter 2 (Section 2.7 - 2.11) hapter 2 (Section 2.12 - 2.14) hapter 3 (Section 3.1 - 3.6) apter 3 (Section 3.7 - 3.11)	onal Field OTAL 0

COU	JRSE (	CODE	COURSE NAME	L	T	P	C
YMA102		.02	ANALYSIS - I	5	1	0	6
С	P	A					
6	0	0		L	Т	P	Н
	<u>i</u>			5	1	0	6
PRE	REQU	ISITE:		<u>i</u>	<u>i</u>	<u> </u>	

COURSE OUTCOMES: Basic concepts of real numbers		
Course outcomes:	Domain	Level
CO1: Define and Explain the Real and Complex Number Systems.	Cognitive	Remembering
		Understanding

	T	·	
CO2: Define and Explain Basic Topology.	Cognitive	ering	
		Understa	ınding
CO3: Define and Explain convergence of sequences and series	Cognitive	Rememb	erino
COS. Define and Explain convergence of sequences and series	Cogmitive	Understa	_
CO4: Define and Explain Continuity of functions	Cognitive	Rememb	_
		Understa	ınding
CO5: Define and Explain the derivative of a real function, the	Cognitive	Rememb	ering
Continuity of Derivatives, Derivatives of Higher Order, and Taylor's		Understa	nding
Theorem.			_
UNIT I The Real and Complex Number Systems:		<u>i</u>	18
Ordered sets, The real field, The complex field, Euclidean spaces.			.1
UNIT II Basic Topology:			18
Finite, Countable and Uncountable sets, Metric space, Compact sets, Pe	erfect Sets, C	Connected	
Sets.			
UNIT III Numerical Sequences and Series:			18
Convergent sequences (in Metric Spaces), subsequences, Cauchy se	equences. Ui	oper and	. <u></u>
Limits, Some Special Sequences, Series, Series of Negative terms, The r	-	-	20 61
UNIT IV Continuity:	oot and racio		18
Limits of functions (in metric spaces) Continuous functions, Continuity			1
	ana		
· · · · · · · · · · · · · · · · · · ·		Uniform	
Compactness, Continuity and Connectedness, Discontinuities, Monotoni		Uniform	
Compactness, Continuity and Connectedness, Discontinuities, Monotoni Continuity, Infinite Limits and Limits at Infinity.		Uniform	18
Compactness, Continuity and Connectedness, Discontinuities, Monotoni Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:	c functions,		18
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The	c functions,		.i
Compactness, Continuity and Connectedness, Discontinuities, Monotoni Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.	c functions,	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL	c functions,	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15	c functions,	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK	Continuity	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin,"Principles of Mathematical Analysis", (3rd Edition) Monotonic Continuities, Monotonic Continuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.	Continuity	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition) Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  Unit I - Chapter 1 (Pages: 3-5, 8-11, 12-16)	Continuity	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition) Monotonic Mathematical Analysis M	Continuity	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition) Monotonic Mathematical Analysis (3rd Edition) Monotonic Mathematical An	Continuity	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition) Monotonic Mathematical Analysis (3rd Edition) Monotonic Mathematical An	Continuity	of Deriv	atives,
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Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition) Monotonic Mathematical Analysis (3rd Edition) Monotonic Mathematical An	Continuity  Coraw-Hill, 2	of Deriv	atives,
Compactness, Continuity and Connectedness, Discontinuities, Monotonic Continuity, Infinite Limits and Limits at Infinity.  UNIT V Differentiation:  The Derivative of a Real Function, Mean Value Theorems, The L'Hospital's Rule, Derivatives of Higher Order, Taylor's Theorem.  LECTURE TUTORIAL 75 15  TEXTBOOK  1. Walter Rudin, "Principles of Mathematical Analysis", (3rd Edition) Monotonic Unit I - Chapter 1 (Pages: 3-5, 8-11, 12-16)  Unit II - Chapter 2 (Pages: 24 - 42)  Unit III - Chapter 3 (Pages: 47-63, 65-69)  Unit IV - Chapter 4 (Pages: 83-97)  Unit V - Chapter 5 (Section 103-111)  REFERENCES	Continuity  Coraw-Hill, 2	of Deriv	atives,

CO	URSE (	CODE	COURSE NAME L	L	Т	P	C
	YMA103		DIFFERENTIAL EQUATIONS	5	1	0	6
С	P	A					
6	0	0		L	Т	P	Н
		I		5	1	0	6

**PREREQUISITE:** Differentiation and Integration

#### **COURSE OUTCOMES:**

Course outcomes:	Domain	Level
<b>CO1: Find</b> The general solution of the homogeneous equations using various methods.	Cognitive	Remembering Understanding
<b>CO2:</b> Solve the homogeneous linear system with constant coefficients and special functions.	Cognitive	Applying
CO3: Find the critical points and stability for linear systems by Liapounov's direct method.	Cognitive	Remembering Understanding
<b>CO4:</b> Solve First order linear partial differential equations using various methods.	Cognitive	Applying
CO5: Solve initial and boundary value problems.	Cognitive	Applying

UNIT I 18

The general solution of the homogeneous equation – The use of one known solution to find another – The method of variation of parameter – Power series solutions – Series solutions of first order equations – Second order linear equations – ordinary points – Regular singular points – Gauss hyper geometric equations – the point 0 at infinity.

# UNIT II Legendre polynomials – Properties of Legendre polynomials – Bessel functions – The gamma function – Properties of Bessel function – linear systems – Homogeneous linear system with constant coefficients. UNIT III 18

The existence and uniqueness of solutions – The method of Successive approximation – Picard's theorem – Types of critical points – Critical points and stability for linear systems – Stability by Liapunov's direct method.

UNIT IV 18

First order partial differential equations – Linear equations of the first order – Partial differential equations – Compatible systems – Charpit's method – Jacobi's method – Integral surface through a given circle.

UNIT V 18

Solution of initial and boundary value problems – Characteristics – D'Alembert's solution – Significance of characteristic curves – Laplace transforms solutions for displacement in a string – a long string under its weight – Longitudinal vibration of a elastic bar with prescribed force on one end – free vibrations of string.

LECTURE	TUTORIAL	TOTAL
<b>75</b>	15	90

#### **TEXTBOOK**

- 1. Simmons, G.F.,"Differential Equations with Applications and Historical Notes", TMH, New Delhi, 2003
- 2. T. Amarnath, "An Elementary Course in Partial Differential Equations", Narosa, New Delhi, 1997.
  - Unit I- Chapter 3: Sections 15,16,19, Chapter 5: Sections 26 to 31

Unit II- Chapter 8: Sections – 44 to 47, Chapter 10: Sections – 54 to 56

Unit III- Chapter 13: Sections – 68, 69, Chapter 11: Sections – 60, 61

Unit IV – Chapter 1: Sections – 1.4 to 1.9

Unit V - Chapter 2: Sections – 2.1, 2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.5, 2.5.1, 2.5.2

#### REFERENCES

- 1. W.T.Reid, "Ordinary Differential Equations", John Wiley, New York, 1971.
- 2. E.A.Coddington and E.Levinson, "Theory of ODE", Mc Graw Hill Publishing Company, New york, 1955.
- 3. J.N. Sneddon, "Elements of Partial Differential Equations", Mc Graw Hill Publishing Company, New york, 1957.

CO	URSE (	CODE	COURSE NAME	L	T	P	$\mathbf{C}$	
	YMA10	)4	DISCRETE MATHEMATICS	5 1		0	6	
C	P	A						
6	0	0		L	Т	P	Н	
				5	1	0	6	
PRE	CREQU	ISITE:	Algebra					
	IRSE O		ŒS:					
	rse outco			Doma		Level		
CO <sub>1</sub>	: Defir	ne and I	Explain Basic logical operations.				emembering nderstanding	
CO <sub>2</sub>	2: <b>Defi</b> r Calcu		Explain the theory of inference for the statement			:	emembering Jnderstanding	
CO3	3: Solve	Recurre	ence Relations using Generating Functions.	Cogni	tive	Applyin	g	
CO <sub>4</sub>	l: Defin	e and E	xplain Lattices and Boolean Algebra.	Cogni	tive	Remembering Understanding		
COS	5: Defir	e and I	Explain Grammar and Languages.	Cogni	tive	Rememb Understa	_	
UNI	гі Ма	themat	ical Logic :				18	
Basi	c logica	l operat	ons, conditional and biconditional statements, tauto	ologies, c	contra	diction,		
	nal forn	-		-				
UNI	ГИTh	e theor	of inference for the statement Calculus:				18	
Rule	s of infe	erence, (	Consistency, Automatic Theorem proving, Predicat	e Calculı	ıs, qu	antifiers,		
Infer	ence Th	eory of	the Predicate Calculus.					

Polynomial expressions, telescopic form, recursion theorem, closed form expression, generating

**18** 

18

**UNIT III Recurrence Relations and Generating Functions:** 

**UNIT IV** Lattices and Boolean Algebra:

function, solution of recurrence relation using generating function.

Partial ordered sets, Properties of Lattices, Lattices as Algebraic Systems, Boolean Algebra.

UNIT V Grammar and Languages:

Phrase structure grammars, rewriting rules, derivation sentential forms, language generated by grammar, regular, context free and context sensitive grammar and languages.

LECTURE	TUTORIAL	TOTAL
<b>7</b> 5	15	90

#### **TEXTBOOK**

1. P. Tremblay, R. Manohar,"Discrete Mathematical Structure with Applications to Computer Science", Mc Graw-Hill International Edition, 1997.

Unit I - Chapter 1 (Section 1.1,1.2 & 1.3)

Unit II - Chapter 1 (Section 1.4, 1.5 & 1.6)

Unit IV - Chapter 4 (Section 4.1& 4.2)

Unit V – Chapter 4 (Section 4.6)

2. Alan Doerr, "Applied Discrete Structure for Computer Science", Pearson Education, 2013 Unit III – Chapter 8 (Section 8.1,8.2,8.3 &8.5)

#### **REFERENCE**

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Mc Graw-Hill International Edition, 2002.

COURSE CODE			COURSE NAME	L	T	P	C
	YMA20	)1	LINEAR ALGEBRA	5	1	0	0
С	P	A					
6	0	0		L	Т	P	Н
		<u>i</u>		5	1	0	6

**PREREQUISITE:** Group theory and Ring theory

#### **COURSE OUTCOMES:**

Course outcomes:	Domain	Level
CO1:Define and Explain Elementary Basic Concepts- Linear Independence and Bases.	Cognitive	Remembering Understanding
CO2: Define and Explain Dual Spaces- Inner Product Space- Modules.	Cognitive	Remembering Understanding
<b>CO3: Solve</b> the Algebra of Linear Transformations to find characteristics roots.	Cognitive	Applying
<b>CO4: Define and Explain</b> Canonical Forms, Triangular form, Nilpotent Transformations, Jordan Form and Rational Canonical form.	Cognitive	Remembering Understanding

	nd Explain Trace and Transpose, Determinants,	Cognitive	Remembering
Hermitia forms.	n, Unitary and Normal Transformations, Real Quadratic		Understanding
UNIT I			18
	sic Concepts- Linear Independence and Bases.		10
UNIT II			18
	D., 1., C., M. 1.1.		10
Duai Spaces- II	nner Product Space- Modules.		
UNIT III			18
	Linear Transformations- Characteristics Roots- Matrices	5.	i
UNIT IV			18
	ns: Triangular form- Nilpotent Transformations- Jordan F	Form - Ratio	<u>i</u>
canomear Forn form.	is. Thangular form- tympotent Transformations- Joidan I	omi - Katioi	nai Canonical
UNIT V			18
	spose – Determinants- Hermitian, Unitary and Normal T	ransformatio	<u>i</u>
Real Quadratic	1		
LECTURE	TUTORIAL		TOTAL
75	15 15		90
TEXTBOOK			1 70
	.,"Topics in Algebra", Willey Eastern 1975.		
	ter 4 (Section 4.1 & 4.2)		
Unit II - Cha	pter 4 (Section 4.4 – 4.5) Unit III - Chapter 6 (Section 6	6.1 - 6.3	
Unit IV - Ch	apter 6 (Section 6.4 – 6.7) Unit V - Chapter 6 (Sect	ion 6.8 – 6.1	1)
REFERENCES			
1. John B. Frale	eigh, "A First Course in Abstract Algebra", Narosa Public	cation, Third	Edition, 2013.
2 P M Cohn			
2. I . IVI. CUIII.	"Basic Algebra", Springer's Publications, Second Edition	n, 2003.	

COURSE	CODE	COURSE NAME	L	Т	P	C
YMA2	02	ANALYSIS - II	5	1	0	6
C P	A					
6 0	0		L	Т	P	Н
			5	1	0	6
PREREQU	ISITE:	Basic concepts of convergence and uniform converg	gence			
COURSE O	UTCON	ЛЕS:				
Course outc			Doma	in	Level	
CO1: Defi	ne and	<b>Explain</b> Existence, Properties of the Integral, nd Differentiation.	Cognit		Rememl Underst	_
		Explain Uniform convergence and Continuity.	Cognit	ive	Remembering Understanding	
	e and I	Explain Uniform convergence and Integration and on.	Cognit	ive	Remembering Understanding	
		Explain Set functions, Construction of Lebesgue easurable function, Simple functions in measure.	Cognit	ive	Rememl Underst	_
CO5: Defi	ne and	<b>Explain</b> Integration Comparison with the Riemann ration of Complex functions, Functions of class $\mathcal{J}^2$ .	Cognit	ive	Remembering Understanding	
UNIT I			i	<u>i</u>		18
Definition a	nd Exis	tence of the Integral, Properties of the Integral, Integral	ration ar	nd Di	fferentia	tion.
UNIT II						18
Uniform Co	nvergei	nce, Uniform convergence and Continuity.				
UNIT III						18
	nvergen	ce and Integration, Uniform convergence and Difference	entiation	l <b>.</b>		1 -0
UNIT IV						18
Set function measure.	s, Cons	truction of Lebesgue Measures, Measurable function	, Simple	func	tions in	
UNIT V						18
Integration	Compar	ison with the Riemann Integral, Integration of Comp	lex func	tions,	Functio	
class $\mathcal{J}^2$ .	T	TOO DI A I			mor	7 A T
LECTUR		JTORIAL			TOT	AL
75	15				90	
TEXTBOO		rinciples of Mathematical Analysis", (3 <sup>rd</sup> Edition), N	<i>I</i> - C	TT:11	2016	

Unit I - Chapter 6 (Pages: 120-135)

Unit II - Chapter 7 (Pages: 143-151)

Unit III - Chapter 7 (Pages: 151-154)

Unit IV - Chapter 11 (Pages: 300-314)

Unit V - Chapter 5 (Section 314-325)

#### **REFERENCES:**

- 1. Shanti Narayan, "A course of Mathematical Analysis", S. Chand & Company Ltd New Delhi, 2005.
- 2. Apostol, T.M, "Mathematical Analysis", Narosa Book Distributors Pvt Ltd, 2<sup>nd</sup> Edition, New Delhi, 1996.
- 3. Malik, S.C, "Mathematical Analysis", Wiley Eastern Ltd. 2017.

COURSE CODE YMA203			COURSE NAME DIFFERENTIAL GEOMETRY	L 5	T 1	P 0	C 6
С	P	A					
6	0	0		L	Т	P	Н
	<u>i</u>	<u>i</u>		5	1	0	6

**PREREQUISITE:** Multivariable calculus and vector calculus

#### COURSE OUTCOMES:

Course outcomes:	Domain	Level
CO1: Define and Explain Arc length, tangent, normal and binormal curvature and torsion, contact between curves and surfaces, Tangent surface involutes and evolutes.	Cognitive	Remembering Understanding
CO2: Define and Explain Surfaces of revolution, Helicoids, Families of curves and Isometric correspondence.	Cognitive	Remembering Understanding
CO3: Define and Explain Normal property of geodesic, Geodesic parallels, Gaussian curvature and Conformal mapping.	Cognitive	Remembering Understanding
CO4: Define and Explain Second fundamental form, Lines of curvature, Developables associated with curves on surfaces and Parallel surfaces.	Cognitive	Remembering Understanding
CO5: Define and Explain Compact surfaces whose points are umbilics, Gaussian or mean curvature, Conjugate points on geodesics	Cognitive	Remembering Understanding
UNIT I		18

Definition of Space curves – Arc length – tangent – normal and binormal – curvature and torsion – contact between curves and surfaces – tangent surface – involutes and evolutes – intrinsic equations – Fundamental Existence Theorem for space curves – Helics.

UNIT II	18
Definition of surface - Curves on a surface - Surfaces of revolution - Helicoids - Metric -	
Direction coefficients - Families of curves - Isometric correspondence - Intrinsic properties -	
Geodesics - Canonical geodesic equations.	
IINIT III	18

Normal property of geodesic - Existence theorems - Geodesic parallels - Geodesic curvature - Gauss Bonnet theorem - Gaussian curvature - Surfaces of constant curvature - Conformal mapping - Geodesic mapping.

UNIT IV 18

Second fundamental form - Principal curvatures- Lines of curvature — Developables - Developables associated with space curves - Developables associated with curves on surfaces- Minimal surfaces and ruled surfaces - Fundamental equations of Surface theory - Parallel surfaces.

UNIT V 18

Compact surfaces whose points are umbilics- Hilbert's lemma- Compact surfaces of constant Gaussian or mean curvature- Complete surfaces- Characterization of complete surfaces- Hilbert's theorem- Conjugate points on geodesics.

LECTURE	TUTORIAL	TOTAL
75	15	90

#### **TEXTBOOK**

1. T. J. Wilmore, "An introduction to Differential Geometry", Oxford University Press, 1997.

#### REFERENCES

- 1. Do Carmo, "Geometry of curves and surfaces", Academic Press, 2017.
- 2. D.Somasundaram, "Differential Geometry", Narosa Publ. House, Chennai, 2005.
- 3. J.A.Thorpe, "Elementary Topics in Differential Geometry", Springer Verlag, New York, 1979.

CO	URSE (	CODE	COURSE NAME	L	Т	P	C
	YMA20	)4	OPERATIONS RESEARCH	5	1	0	6
С	P	A					
6	0	0		L	Т	P	Н
				5	1	0	6
PRE	CREQU	ISITE:	Nil		<u> </u>		
COU	JRSE O	UTCOM	MES:				
Cou	rse outco	omes:		Doma	in	Level	
CO <sub>1</sub>	l: Defii	ne and l	Explain Decision theory in detail.	Cogni	tive	Remem Underst	_
CO2	2: Expl	ain and	solve problems in PERT and CPM	Cogni	tive	Underst Applyir	_
CO3	_	tory Co	rministic inventory control models and probabilistic ontrol Models and <b>solve</b> problems by using the	Cogni	tive	Underst Applyir	_
CO4			ntial Features of Queueing System, Classification of lels and find solution of Queueing Models.	Cogni	tive	Underst Remem	_
COS			acement and maintenance models and solve using these methods.	Cogni	tive	Underst Applyir	_
UNI	TI DE	CISION	THEORY				18

Steps in Decision theory Approach - Types of Decision-Making Environments - Decision Making Under Uncertainty - Decision Making under Risk - Posterior Probabilities and Bayesian Analysis -

Basic Differences between PERT and CPM - Steps in PERT/CPM Techniques - PERT/CPM Network Components and Precedence Relationships - Critical Path Analysis - Probability in PERT Analysis - Project time-cost Trade Off - Updating the Project - Resource Allocation .

18

Decision Tree Analysis - Decision Making with Utilities.

UNIT II PROJECT MANAGEMENT: PERT AND CPM

#### UNIT III DETERMINISTIC INVENTORY CONTROL MODELS

Meaning of Inventory Control - Functional Classification - Advantage of Carrying Inventory - Features of Inventory System - Inventory Model building - Deterministic Inventory Models with no shortage - Deterministic Inventory with Shortages

Probabilistic Inventory Control Models:

Single Period Probabilistic Models without Setup cost - Single Period Probabilities Model with Setup cost.

#### UNIT IV QUEUEING THEORY

18

18

Essential Features of Queueing System - Operating Characteristic of Queueing System - Probabilistic Distribution in Queueing Systems - Classification of Queueing Models - Solution of Queueing Models - Probability Distribution of Arrivals and Departures - Erlangian Service times Distribution with k-Phases.

#### UNIT V REPLACEMENT AND MAINTENANCE MODELS

18

Failure Mechanism of items - Replacement of Items Deteriorates with Time - Replacement of items that fail completely - other Replacement Problems.

LECTURE	TUTORIAL	TOTAL
75	15	90

#### **TEXTBOOK**

1. J.K.Sharma, "Operations Research Theory and Applications", Third Edition, Macmillan India Ltd., 2007,

Unit I - Chapter-11 (Section 11.1 - 11.8)

Unit II - Chapter-13 (Section 13.1 - 13.9)

Unit III - Chapter-14 (Section 14.1 - 14.8); Chapter-15: (Section 15.1 - 15.4)

Unit IV - Chapter-16 (Section 16.1 - 16.9); Appendix 16. A (PP 774-781)

Unit V - Chapter-17 (Section 17.1 - 17.5)

#### **REFERENCES**

- 1.F.S. Hillier and J.Lieberman, "Introduction to Operations Research" (8th Edition), Tata McGraw Hill Publishing Company, New Delhi, 2006.
- Beightler. C, D.Phillips, B. Wilde, "Foundations of Optimization" (2nd Edition) Prentice Hall Pvt Ltd., New York, 1979
- 3.Bazaraa, M.S; J.J.Jarvis, H.D.Sharall, "Linear Programming and Network flow", John Wiley and sons, New York, 1990.
- 4. Gross, D and C.M.Harris, "Fundamentals of Queueing Theory", (3<sup>rd</sup> Edition), Wiley and Sons, New York, 1998.
- Hamdy A. Taha, "Operations Research" (sixth edition), Prentice Hall of India Private Limited, New Delhi. 2007

	URSE (		COURSE NAME	L	Т	P	C
	YMA30	)1	FIELD THEORY	5	1	0	6
С	P	A					
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PRE	REQU	ISITE:	Algebra	i		<u>i</u>	
COU	JRSE O	UTCOM	IES:				
Cour	rse outco	mes:		Doma	in	Level	
	Extensi	ion - Tra	<b>Explain</b> Extension fields – Finite Extension – Algebraic nscendence of e.	Cogni		Remem Underst	anding
CO2			<b>Explain</b> Roots of Polynomials Remainder Theorem – More about roots.	Cogni	tive	Rememi Unders	_
CO3			xplain Elements of Galois Theory- Fixed field – ion- Fundamental Theorem.	Cogni	tive	Remem Underst	_
CO4			<b>Explain</b> Solvability by radicals – Solvable group – ver the rational.	Cogni	tive	Remem Underst	
CO5			<b>Explain</b> Finite fields - Wedderburn's theorem on rings — A Theorem of Frobenius.	Cogni	tive	Remem Underst	
UNI							18
Exte	nsion fi	elds – F	inite Extension – Algebraic Extension - Transcender	ice of e.			
UNI	ΓII						18
Root	s of Pol	ynomia	ls Remainder Theorem – Splitting field - More abo	ut roots	•		
UNI	ГШ						18
Eler	ments of	f Galois	Theory- Fixed field – Normal extension- Fundamen	tal Theo	orem.		i
UNI	ΓIV						18
Solv	ability t	y radica	als – Solvable group – Galois group over the rational				
UNI	ΓV						18
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	ТВООЬ					<u>L</u>	•••••
1. N	I. Herste	ein,"Top	pics in Algebra", Willey Eastern, 1975.				
REF	EREN	CES					
<b>1.</b> Jo	ohn B. F	raleigh,	"A First Course in Abstract Algebra", Narosa Public	cation, 7	Third	Edition,	2013
2. P	. M. Co	hn,"Bas	ic Algebra", Springers Publications, Second Edition,	, 2003.			

CO	URSE (	CODE	COURSE NAME	L	Т	P	C
	YMA30	2	TOPOLOGY	5	1	0	6
С	P	A					
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	ii	·············		5	1	0	6
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CO <sub>1</sub>	l: Defir	ne and ]	Explain Topological Spaces	Cogni	tive	Remem Unders	
CO <sub>2</sub>	2: Defir	ne and l	Explain Continuous Functions	Cogni	tive	Remem Unders	bering tanding
CO3	3: Defin	e and F	Explain Connectedness	Cogni	tive	Remem	_
CO <sub>4</sub>	l: Defin	e and E	Explain Compactness	Cogni	tive	Remem Unders	_
COS	5: Defir	ne and	Explain Countability and Separation Axiom	Cogni	tive	Remem	bering
	<del></del>	h	al Spaces	-			18
Topo	ological	spaces	- Basis for a topology - The order topology - The	product to	polog	y	
			space topology.				
			is Functions				18
			t points-Continuous functions - the product topolo	••	metrio	2	
			tric topology (continued) - Uniform limit theorem				
	T III (						18
Con	nected s	paces -	connected subspaces of the Real line - Componen	its and loca	al con	nectedn	ess.
	T IV C						18
			compact subspaces of the Real line - Limit	Point C	ompa	ctness -	- Local
	pactnes						·······
			lity and Separation Axiom				18
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			Theorem - The Tietz extension theorem.				
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	TBOOK	<del>.</del>				90	
1. Ja		Munkr	es, "Topology", (2nd Edition) PHI Learning Pv	t. Ltd., (T	hird	Indian I	Reprint)
	Unit	I - Cha	pter 2: Sections 12 to 17				
			upter 2: Sections 18 to 21 (Omit Section 22)				
			apter 3: Sections 23 to 25				
			napter 3: Sections 26 to 29				
	Unit	V - Cha	apter 4: Sections 30 to 35				

REFERENCES

- 1. J. Dugundji, "Topology", Prentice Hall of India, New Delhi, 1975.
- 2. George F.Sinmons, "Introduction to Topology and Modern Analysis", McGraw Hill Book Co., 1963.
- 3. J.L. Kelly, "General Topology", Van Nostrand, Reinhold Co., New York.1995
- 4. L.Steen and J.Subhash, "Counter Examples in Topology", Holt, Rinehart and Winston, New York, 1970.
- 5. S.Willard, "General Topology", Addison Wesley, Mas.1970.

CO	URSE C	ODE	COURSE NAME	L	Т	P	С
	YMA303	3	MEASURE THEORY	5	1	0	6
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6	0	0		L	Т	P	Н
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CO2			Explain General Convergence Theorems – Signed The Radon Nikodym Theorem.	Cogni	tive	Remem Unders	bering tanding
CO			Explain The L <sup>p</sup> – spaces – Outer measure and – The Extension Theorem.	Cogni	tive	Remem Unders	
CO <sub>4</sub>			Explain The Lebesgue-Stieltjes integral – Product ategral operators.	Cogni	tive	Remem Unders	
COS			<b>Explain</b> Inner measure – Extension by sets of measure	Cogni	tive	Remem	
			odory outer measure Hausdorff measure	8		Unders	_
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UNI	ΤΙΙ						18
Gen	eral Conv	ergen	ce Theorems – Signed measures – The Radon Nikody	ym The	orem.	•	
UNI	T III						18
The	L <sup>p</sup> – spac	es – C	Outer measure and measurability- The Extension Theo	orem.			
UNI		a					18
The	Lebesgue	e-Stiel	tjes integral – Product measures – Integral operators.				
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I.H.L	.Royden	, Real	Analysis, 3 <sup>rd</sup> Edition, Standford University, Prentic	e – Hall	of Ir	idia priv	ate
Lim	ited, Ne	w Del	hi. 2002.				
(Cha	apter 11	- Sec	tion 1 to 7, Chapter 12 - Section 1 to 9).				
REFE	CRENC	ES					
1.P.R.	Halmos	s, "Me	easure Theory", Graduate Text in Mathematics, Sprin	nger-Vei	rlag, i	1979.	
2.Inde	r K. Rar	na. "A	n Introduction to Measure and Integration", (2 <sup>nd</sup> ed.)	. Narosa	a Pub	lishing F	House.
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**UNIT IV** Design of Experiments

Analysis of variance – One way and two way classifications – Completely randomized design – Randomized block design – Latin square design.

#### **UNIT V Statistical Quality Control**

18

Analysis of variance: Control charts for measurements (X and R charts) – control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling, Introduction to SPSS.

LECTURE	TUTORIAL	TOTAL
<b>7</b> 5	15	90

#### **TEXTBOOK**

1. Gupta. S.C., and Kapoor. V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and sons, Thirteenth Edition, 2014.

#### **REFERENCES**

- 1. J.E. Freund, "Mathematical Statistical", 5<sup>th</sup> Edition, Prentice Hall of India, 2001.
- 2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", 5<sup>th</sup> Edition, Thomas and Duxbury, Singapore, 2002.

COI	COURSE CODE		DDE COURSE NAME			P	С
YMA401		1	COMPLEX ANALYSIS	5	1	0	6
C	P	A					
6	0	0		L	Т	P	Н
	İ			5	1	0	6

**PREREQUISITE:** Analysis

#### **COURSE OUTCOMES:**

Course outcomes:	Domain	Level
<b>CO1: Define and Explain</b> Line Integrals- Rectifiable arc – Line	Cognitive	Remembering
integrals as functions of arc- Cauchy's Theorem for rectangle-		Understanding
Cauchy's Theorem for disc		
CO2: Define and Explain Integral Formula – Higher derivatives –	Cognitive	Remembering
Removable singularities – Taylor's theorem – Zeros and Poles –		Understanding
The Local Mapping – The Maximum Principle.		
CO3: Define and Explain The General Statement of Cauchy's	Cognitive	Remembering
Theorem – Proof of Cauchy's Theorem – Locally Exact		Understanding
Differentials – Multiply Connected Regions.		
<b>CO4: Define and Explain</b> The Residue Theorem – The Argument	Cognitive	Remembering
Principle – Evaluation of Definite Integrals – The Mean – value		Understanding
property – Poisson's formula- Schwarz's Theorem – The		
Reflection Principle.		

CO5: Define and Explain Weierstrass's Theorem – The Taylor Series – The Laurent Series – Partial Fractions- Jensen's Formula –	Cognitive	Remember Understan	_
Hadamard's Theorem			10
UNIT I	1?		18
Line Integrals- Rectifiable arc – Line integrals as functions of arc- Cauc Cauchy's Theorem for disc.	ny's Theore	m for recta	ngie-
UNIT II			18
The Index of a point - Integral Formula - Higher derivatives - Remo	ovable singu	larities –	
Taylor's theorem – Zeros and Poles – The Local Mapping – The Maximu	_		
UNIT III	•		18
Chains and Cycles – Simple Connectivity – Homology – The General Theorem – Proof of Cauchy's Theorem – Locally Exact Different Regions.			•
UNIT IV			18
The Residue Theorem – The Argument Principle – Evaluation of Defin value property – Poisson's formula- Schwarz's Theorem – The Reflectio	_	s – The Me	an –
UNIT V			18
Weierstrass's Theorem - The Taylor Series - The Laurent Series -	Partial Frac	ctions- Jen	sen's
Formula – Hadamard's Theorem.			
LECTURE TUTORIAL		TOTA	L
75 15		90	
TEXTBOOK 100 March 100 Mar			
1.Lars V.Ahlfors, "Complex Analysis", 3 <sup>rd</sup> Edition McGraw Hill Educat	tion (India) I	Private	
Ltd.2013.	.4: 4 1 4 - 4	7 0-4:	<i>5</i> 1
Chapter 4 - Section 1.1 to 1.5, Section 2.1 to 2.3, Section 3.1 to 3.4, Section 5.3, Section 6.1 to 6.5.	tion 4.1 to 4	./, Section	5.1
Chapter 5 - Section 1.1 to 1.3, Section 2.1, Section 3.1 & 3.2.			
Chapter 5 - Section 1.1 to 1.5, Section 2.1, Section 3.1 & 5.2.			
REFERENCES:			
S. Poonusamy, "Complex Analysis", Alpha Science Internation 2005.	al Ltd; 2 <sup>nd</sup>	Revised ed	ition,

CO	URSE (	CODE	COURSE NAME	L	Т	P	C
	YMA4	02	FUNCTIONAL ANALYSIS	5	1	0	6
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	ii	i		5	1	0	6
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**PREREQUISITE:** Analysis

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COURSE	•		$\cdot$	,,,,,,	U.J.

Course outcomes:	Domain	Level
CO1: Define and Explain Normed Spaces – Continued of Linear	Cognitive	Remembering
Maps – Hahn – Banach Theorems.		Understanding
CO2: Define and Explain Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems.	Cognitive	Remembering Understanding
<b>CO3: Define and Explain</b> Bounded Inverse Theorem – Spectrum of a Bounded Operator.	Cognitive	Remembering Understanding
CO4: Define and Explain Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems.	Cognitive	Remembering Understanding
CO5: Define and Explain Bounded Operators and adjoint, Normal, Unitary and Self-adjoint Operators.	Cognitive	Remembering Understanding
TINITED T		10

UNIT I 18

Normed Spaces – Continued of Linear Maps – Hahn – Banach Theorems.

UNIT II

Banach Spaces – Uniform Boundedness Principle – Closed Graph and Open Mapping Theorems.

18

18

UNIT III
Bounded Inverse Theorem – Spectrum of a Bounded Operator.

UNIT IV 18

Inner Product Spaces – Orthonormal Sets – Projection and Riesz Representation Theorems.

1

Bounded Operators and adjoint, Normal, Unitary and Self-adjoint Operators.

	J	 	J	1	
LECTURE	TUTORIAL				TOTAL
75	15				90

#### **TEXTBOOK**

**UNIT V** 

1.Balmohan V Limaye, "Functional Analysis", 3<sup>rd</sup> Edition, New Age International (P) Limited Publishers, New Delhi, 2017.

#### **REFERENCES**

- 1. G.F. Simmons, "Introduction to Topology and Modern Analysis", McGraw Hill International Book Company, New York, 1963.
- 2. W. Rudin, "Functional Analysis", Tata McGraw-Hill Publishing Company, New Delhi, 1973.
- 3. E. Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, New York, 1978.
- 4. H. C. Goffman and G.Fedrick, "First Course in Functional Analysis", Prentice Hall of India, New Delhi, 1987.

	URSE (	CODE	COURSE NAME	L	T	P	С
	YMA40	)3	STOCHASTIC PROCESSES	5	1	0	6
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C	P	A					
6	0	0		L	Т	P	H
				5	1	0	6
PRE	EREQU	ISITE: Pi	robability and Statistics	<u>i</u>			<u>i</u>
COI	JRSE OI	UTCOME	S:				
	rse outco			Doma	in	Level	
CO <sub>1</sub>	l: Defin	e and Ex	plain Specification of Stochastic processes,	Cogni	tive	Remem	bering
	Statio	nary proc	esses, Markov Chains with examples			Underst	tanding
CO2			<b>plain</b> Classification of states and chains.	Cogni	tive	Remem	bering tanding
CO3	3: Defin	e and Exp	plain Markov processes with Discrete state space.	Cogni	tive	Remem	
CO4	4: Defin	e and Exp	plain Queuing system	Cogni		Remem	tanding
			plain Auto-correlation functions, cross- and their properties	Cogni	tive	Remem	_
UNI	ΤΙ						18
			finitions and examples – Higher Transition proba	bilities	– Ge	eneraliza	ation of
	_		trails – Sequence of chain – Dependent trains.				18
UNI	T II			- £ 11:	. 1		18
UNI' Marl prob	T II kov cha	ins: Clas – stabili	sification of states and chains – determination ity of a Markov system – Reducible chains –		-		n
UNI' Marl prob	T II kov cha	ins: Clas	sification of states and chains – determination ity of a Markov system – Reducible chains –		-		n
UNI' Marl prob cont UNI' Marl	T II kov cha abilities inuous s T III kov pro- ess and	ins: Clas  – stabilitate space cesses wirelated d	sification of states and chains – determination ity of a Markov system – Reducible chains –	Marko their e Birth	v cha xtensi	ins wit	n h 18 Poissor
UNI' Marl prob cont UNI' Marl proc Marl	T II kov cha habilities inuous s T III kov pro- ess and kov pro-	ins: Clas  – stabilitate space cesses wirelated decesses with	sification of states and chains – determination ity of a Markov system – Reducible chains – s.  th Discrete state space: Poisson processes and distribution – Generalization of Poisson process-h discrete state space (continuous time Markov Chain	Marko their e Birth a	xtensi	ons –	n h 18 Poisson ocess -
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edition. 2013

2. T. Veerarajan, "Random Processes", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008

#### **REFERENCES:**

Vertices.

- 1. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4<sup>th</sup> edition, New Delhi, (2002).
- 2. Srinivasan and Metha, Stochastic Processes,
- 3. Miller, S.L. and Childers, D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, (2004).
- 4. R. Nelson, Probability, "Stochastic Processes, and Queuing Theory: The Mathematics of Computer Performance Modeling", Springer-Verlag, New York, 1995.

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PREREQUISITE:	<u> </u>			
COURSE OUTCOMES: Basic concepts of Graph	Theory			
Course outcomes:	Doma	in	Level	
CO1: Define and Explain Graphs, subgraphs ar	nd trees. Cogni	tive	Remem Underst	_
<b>CO2: Define and Explain</b> Connectivity - Block Hamilton Cycles.	s - Euler tours - Cogni	tive	Remem	
CO3: Define and Explain Matchings and Cover Graphs, Edge Chromatic Number and Viz		tive	Applyin	ıg
CO4: Define and Explain independent sets and colourings.		tive	Rememi Underst	_
CO5: Define and Explain Plane and planar Gra Euler's Formula, The Five-Colour Theore Colour Conjecture- Applications.		tive	Remem Underst	_
UNIT I GRAPHS, SUBGRAPHS AND TREE	$\mathbf{S}$	<u>i</u>		18

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UNIT II CONNECTIVITY, EULER TOURS AND HAMILTON CYCLES

Matchings - Matchings and Coverings in Bipartite Graphs - Edge Chromatic Number -

Connectivity - Blocks - Euler tours - Hamilton Cycles – Applications.

UNIT III MATCHINGS, EDGE COLOURINGS

Vizing's Theorem- Applications.

#### UNIT IV INDEPENDENT SETS AND CLIQUES, VERTEX COLOURINGS

Independent sets - Ramsey's Theorem - Chromatic Number - Brooks' Theorem -

Chromatic Polynomials- Applications.

#### UNIT V PLANAR GRAPHS

18

18

Plane and planar Graphs - Dual graphs - Euler's Formula - The Five-Colour Theorem and the Four-Colour Conjecture- Applications.

LECTURE	TUTORIAL	TOTAL
75	15	90

#### **TEXTBOOK**

1. J.A.Bondy and U.S.R. Murthy, "Graph Theory and Applications", Macmillan, London, 1976.

Unit I - Chapter 1 (Section 1.1 - 1.7); Chapter 2 (Section 2.1 - 2.3)

Unit II - Chapter 3 (Section 3.1 - 3.2); Chapter 4 (Section 4.1 - 4.2)

Unit III - Chapter 5 (Section 5.1 - 5.2); Chapter 6 (Section 6.1 - 6.2)

Unit IV - Chapter 7 (Section 7.1 - 7.2); Chapter 8 (Section 8.1 - 8.2, 8.4)

Unit V - Chapter 9 (Section 9.1 - 9.3, 9.6)

#### **REFERENCES**

- 1. Harary, "Graph Theory" Narosa Publishing House., 2001.
- 2.A.Gibbons, "Algorithmic Graph Theory, Cambridge University Press, Cambridge, 1989.
- 3.R.J.Wilson and J.J.Watkins, "Graphs: An Introductory Approach", John Wiley and Sons, New York, 1989.
- 4.V.K. Balakrishnan, Schaum's Outlines of "Theory and problems of Graph Theory", Tata McGraw Hill Education Private Limited Delhi, 2004.
- 5.S.A.Choudum, "A First Course in Graph Theory", MacMillan India Ltd. 1987.

CO	URSE C	CODE	COURSE NAME	L	T	P	C
7	/MA205	5L	FUZZY SETS AND FUZZY LOGIC	5	1	0	6
С	P	A					
6	0	0		L	Т	P	H
	I	i		5	1	0	6

**PREREQUISITE:** Discrete Mathematics

#### **COURSE OUTCOMES:**

Course outcomes:	Domain	Level
<b>CO1: Define and Explain</b> basic definitions of Crisp sets, the notion of fuzzy sets and basic concepts of fuzzy sets.	Cognitive	Remembering Understanding
CO2: Define and Explain operation on Fuzzy Sets.	Cognitive	Remembering Understanding
CO3: Define and Explain Fuzzy Relations	Cognitive	Remembering Understanding
CO4: Define and Explain Classical Logic.	Cognitive	Remembering Understanding
CO5: Define and Explain Fuzzy logic, fuzzy tautologies - contradictions - equivalence and logical proofs.	Cognitive	Remembering Understanding

#### **UNIT I** Crisp Sets and Fuzzy Sets

18

Crisp sets basic definitions - the notion of fuzzy sets - basic concepts of fuzzy sets.

UNIT II Ope	ration on Fuzzy Sets	18
Fuzzy complen	nent - fuzzy union - fuzzy intersection - combination and general aggregation	
operations.		
UNIT III Fuz	zy Relations	18
Crisp and fuzz - orderings.	y relations - binary relation - equivalence and similarity relations - tolerance rel	ation
UNIT IV Clas	sical Logic	18
Tautologies - c	ontradictions - equivalence - exclusive OR and exclusive NOR - logical proofs.	
UNIT V Fuzz	y Logic	18
Fuzzy logic - a	pproximate reasoning - fuzzy tautologies - contradictions - equivalence and logi	ical
proofs.		
LECTURE	TUTORIAL TOT.	ΔT.
75	1.5	
	15   90	
TEXTBOOKS		
<b>TEXTBOOKS</b> 1. George J. K	lir & Tina A. Folger, "Fuzzy Sets, Uncertainty, and Information", Prentice Hall td., New Delhi, 1988	
TEXTBOOKS  1. George J. K. India Pvt. L.	lir & Tina A. Folger, "Fuzzy Sets, Uncertainty, and Information", Prentice Hall	of
TEXTBOOKS  1. George J. K. India Pvt. L.  2. Timothy J. R. 2010.	lir & Tina A. Folger, "Fuzzy Sets, Uncertainty, and Information", Prentice Hall td., New Delhi, 1988 Ross, "Fuzzy Logic with Engineering Applications", 3 <sup>rd</sup> edition, McGraw-Hill.	of
TEXTBOOKS  1. George J. K. India Pvt. L.  2. Timothy J. R. 2010.  REFERENCE	lir & Tina A. Folger, "Fuzzy Sets, Uncertainty, and Information", Prentice Hall td., New Delhi, 1988 Ross, "Fuzzy Logic with Engineering Applications", 3 <sup>rd</sup> edition, McGraw-Hill.	of
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2. Bart Kosko, "Neural Networks and Fuzzy Systems", Prentice-Hall International, 1992.