

POOMPUHAR COLLEGE (AUTONOMOUS) OF THE TAMIL NADU HR & CE DEPARTMENT MELAIYUR - 609 107

M.Sc Mathematics – Course Structure under CBCS (For the candidates admitted from the academic year 2023 -2024 onwards)

				Maximum Marks		
Part	Study Components & Course Title	Credit	Hours/ Week	CIA	ESE	Total
	SEMESTER – I					
	Core - I: Algebraic Structures.	5	7	25	75	100
	Core - II: Real Analysis I	5	7	25	75	100
Part A	Core - III: Ordinary Differential Equations	4	6	25	75	100
	Elective-I (Choose one from Group-A)	3	5	25	75	100
	Elective-II (Choose one from Group-B)		5	25	75	100
	Total	20	30			500
	SEMESTER – II					
	Core - IV: Advanced Algebra	5	6	25	75	100
	Core - V: Real Analysis II	5	6	25	75	100
	Core - VI: Partial Differential Equations	4	6	25	75	100
Part A	Elective-III (Choose one from Group-C)	3	4	25	75	100
	Elective-IV (Choose one from Group-D)	3	4	25	75	100
Part B	Skill Enhancement Course (SEC-I): Mathematical Documentation using LATEX)	2	4	25	75	100
	Total	22	30			600

Signature of the Subject Experts

List of Elective Courses (Choose 1 out of 3 in each group)

Semester I : Elective I and Elective II

Elective I to be chosen from Group A and Elective II to be chosen from Group B

Group A:

- **1.** Graph Theory and Applications $\sqrt{}$
- 2. Programming in C++
- 3. Formal Languages and Automata Theory

Group B:

- 1. Discrete Mathematics
- 2. Fuzzy Sets and Their Applications
- 3. Mathematical Statistics

Semester II : Elective III & Elective IV

Elective III to be chosen from Group C and Elective IV to be chosen from Group D

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Group C:

- 1. Algebraic Topology
- 2. Tensor Analysis and Relativity
- 3. Optimization Techniques

Group D:

- 1. Wavelets
- 2. Mathematical Modelling
- 3. Fluid Dynamics

Signature of the Subject Experts

Objectives of the	To introduce the concepts and to develop working knowledge on
Course	class equation, solvability of groups, finite abelian groups, linear
	transformations, real quadratic forms
Course Outline	UNIT-I :Homomorphisms-Automorphisms
	Chapter 2: Sections 2.7 and 2.8
	UNIT-II : Another Counting Principle - Class equation for finite
	groups and its applications -Sylow's theorems.
	Chapter 2: Sections 2.11 and 2.12
	UNIT-III :Linear Transformations: Canonical forms -Triangular
	form - Nilpotent transformations.
	Chapter 6: Sections 6.4 and 6.5
	UNIT-IV :Jordan form - Rational Canonical form.
	Chapter 6 : Sections 6.6 and 6.7
	UNIT-V: Trace and Transpose - Hermitian, Unitary, Normal
	Transformations.
	Chapter 6 : Sections 6.8 and 6.10 (Omit 6.9)
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC
internal component	/ others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	I.N. Herstein. Topics in Algebra (II Edition) Wiley Eastern Limited,
	New Delhi, 2007.

Reference Books	. M.Artin, Algebra, Prentice Hall of India, 1991.					
	2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, <i>Basic Abstract</i>					
	Algebra (II Edition) Cambridge University Press, 1997. (Indian					
	Edition)					
	3. I.S.Luther and I.B.S.Passi, <i>Algebra</i> , Vol. I – Groups(1996); Vol.					
	II Rings, Narosa Publishing House , New Delhi, 1999					
	4. D.S.Malik, J.N. Mordeson and M.K.Sen, <i>Fundamental of</i>					
	Abstract Algebra, McGraw Hill (International Edition), New					
	York. 1997.					
	5. N.Jacobson, <i>Basic Algebra</i> , Vol. I & II W.H.Freeman (1980);					
	also published by Hindustan Publishing Company, New Delhi.					
Website and	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics,					
e-Learning Source	http://www.opensource.org, www.algebra.com					

Students will be able to

CLO 1: Define homomorphisms, Cauchy's theorem and Sylow's theorem for abelian groups, Define automorphisms.

CLO 2: Recall basic counting principle, define class equations to solve problems, explain Sylow's theorems and apply the theorem to find number of Sylow subgroups

CLO 3: Define similar Transformations, define invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants.

CLO 4: Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companion matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristic polynomial of linear transformation.

CLO 5: Define trace, define transpose of a matrix, explain the properties of trace and transpose, to find trace, to find transpose of matrix, to prove Jacobson lemma using the triangular form, define symmetric matrix, skew symmetric matrix, adjoint, to define Hermitian, unitary, normal transformations and to verify whether the transformation in Hermitian, unitary and normal

		POs						PSOs		
	1	2	3	4	5	6	1	2	3	
CLO1	3	1	3	2	3	3	3	2	1	
CLO2	2	1	3	1	3	3	3	2	1	
CLO3	3	2	3	1	3	3	3	2	1	
CLO4	1	2	3	2	3	3	3	2	1	
CLO5	3	1	2	3	3	3	3	2	1	

Signature of the Subject Experts

SEMESTER: I PART: A CORE COURSE – II	23AU:P04M2 REAL ANALYSIS - I	Credit:5 Hours:7
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Objectives of the	To work comfortably with functions of bounded variation, Riemann-
Course	Stieltjes Integration, convergence of infinite series, infinite product and
	uniform convergence and its interplay between various limiting
	operations.
Course Outline	UNIT-I : Functions of bounded variation - Introduction - Properties
	of monotonic functions - Functions of bounded variation - Total
	variation - Additive property of total variation - Total variation on [a,
	x] as a function of x - Functions of bounded variation expressed as the
	difference of two increasing functions - Continuous functions of
	bounded variation.
	Chapter – 6 : Sections 6.1 to 6.8
	Infinite Series : Absolute and conditional convergence - Dirichlet's
	test and Abel's test - Rearrangement of series - Riemann's theorem on
	conditionally convergent series.
	Chapter 8 : Sections 8.8, 8.15, 8.17, 8.18
	UNIT-II : The Riemann - Stieltjes Integral - Introduction - Notation -
	The definition of the Riemann - Stieltjes integral - Linear Properties -
	Integration by parts- Change of variable in a Riemann - Stieltjes
	integral - Reduction to a Riemann Integral - Euler's summation
	formula - Monotonically increasing integrators, Upper and lower
	integrals - Additive and linearity properties of upper, lower integrals -
	Riemann's condition - Comparison theorems.
	Chapter - 7 : Sections 7.1 to 7.14
	UNIT-III : The Riemann-Stieltjes Integral - Integrators of bounded
	variation-Sufficient conditions for the existence of Riemann-Stieltjes
	integrals-Necessary conditions for the existence of RS integrals- Mean
	value theorems -integrals as a function of the interval - Second
	fundamental theorem of integral calculus-Change of variable -Second
	Mean Value Theorem for Riemann integral- Riemann-Stieltjes
	integrals depending on a parameter-Differentiation under integralsign-
	Lebesgue criterion for existence of Riemann integrals.
	Chapter - 7 : 7.15 to 7.26

	UNIT-IV :Infinite Series and infinite Products - Double sequences -
	Double series - Rearrangement theorem for double series - A sufficient
	condition for equality of iterated series - Multiplication of series -
	Cesarosummability.
	Chapter - 8 : Sections 8.20, 8.21 – 8.25
	Power series - Multiplication of power series - The Taylor's series
	generated by a function - Bernstein's theorem - Abel's limit theorem.
	Chapter 9 : Sections 9.14 9.15, 9.19, 9.20, 9.22
	UNIT-V: Sequences of Functions - Point-wise convergence of
	sequences of functions - Examples of sequences of real - valued
	functions - Uniform convergence and continuity - Cauchy condition for
	uniform convergence - Uniform convergence of infinite series of
	functions - Riemann - Stieltjes integration - Non-uniform Convergence
	and Term-by-term Integration - Uniform convergence and
	differentiation - Sufficient condition for uniform convergence of a
	series - Mean convergence.
	Chapter -9 Sections 9.1 – 9.6, 9.8,9.9,9.10,9.11, 9.13
Extended	Questions related to the above topics, from various competitive
Professional	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC /
Component (is a part	others to be solved
of internal	(To be discussed during the Tutorial hour)
component only,	
Not to be included in	
the External	
Examination	
question paper)	
Skills acquired from	Knowledge, Problem Solving, Analytical ability, Professional
this course	Competency, Professional Communication and Transferrable Skill
Recommended	Tom M.Apostol : Mathematical Analysis, 2 nd Edition, Narosa
Text	Publishing Company Inc. New Delhi, 2002.

Reference Books	1. Bartle, R.G. Real Analysis, John Wiley and Sons Inc., 1976.			
	2. Rudin,W. Principles of Mathematical Analysis, 3 rd Edition. McGraw			
	Hill Company, New York, 1976.			
	3. Malik, S.C. and SavitaArora. Mathematical Anslysis, Wiley Eastern			
	Limited.New Delhi, 1991.			
	4. Sanjay Arora and BansiLal, Introduction to Real Analysis,			
	SatyaPrakashan, New Delhi, 1991.			
	5. Gelbaum, B.R. and J. Olmsted, Counter Examples in Analysis,			
	Holden day, San Francisco, 1964.			
	6. A.L.Gupta and N.R.Gupta, Principles of Real Analysis, Pearson			
	Education, (Indian print) 2003.			
Website and	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics,			
e-Learning Source	http://www.opensource.org, www.mathpages.com			

Students will be able to

CLO1: Analyze and evaluate functions of bounded variation and Rectifiable Curves.

CLO2:Describe the concept of Riemann-Stieltjes integral and its properties.

CLO3:Demonstrate the concept of step function, upper function, Lebesgue function and their integrals.

CLO4:Construct various mathematical proofs using the double sequences and series and power series.

CLO5: Formulate the concept of uniform convergence and continuity.

<u> </u>									
		POs					PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Outcome Mapping:

Signature of the Subject Experts

Objectives of the	To develop strong background on finding solutions to linear					
Course	differential equations with constant and variable coefficients and also					
	with singular points, to study existence and uniqueness of the solutions					
	of first order differential equations					
Course Outline	UNIT-I : Linear equations with constant coefficients					
	Second order homogeneous equations-Initial value problems-Linear					
	dependence and independence-a formula for Wronskian-Non-					
	homogeneous equation of order two.					
	Chapter 2: Sections 1 to 6					
	UNIT-II : Linear equations with constant coefficients(Continued)					
	Homogeneous and non-homogeneous equations of order n -Initial					
	value problems for the nth order equations –equations with real					
	constants.					
	Chapter 2 : Sections 7 to 10.					
	UNIT-III :Linear equation with variable coefficients					
	Introduction - Initial value problems for the homogenous equations –					
	Solutions of the homogenous equations – Wronskian and linear					
	independence – reduction of the order of a homogeneous equation – the					
	non-homogeneous equation.					
	Chapter : 3 Sections 1 to 6					
	UNIT-IV :Linear equation with regular singular points					
	Introduction – the Euler equation – Second order equations with					
	regular singular points and an example – Second order equations with					
	singular points – the general case.					
	Chapter 4 : Sections 1 to 4					
	UNIT-V : The exceptional cases – the Bessel Equation –the Bessel					
	Equation (Continued) – Regular singular points at infinity.					
	Chapter 4 : Sections 6 to 9					
Extended	Questions related to the above topics, from various competitive					
Professional	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /					
Component (1s a part	others to be solved					
ot internal	(10 be discussed during the Tutorial hour)					
component only,						
Not to be included in						
the External						
Examination						
question paper)						

Skills acquired from	Knowledge, Problem Solving, Analytical ability, Professional				
this course	Competency, Professional Communication and Transferrable Skill				
Recommended	E.A.Coddington, A introduction to ordinary differential equations (3 rd				
Text	Printing) Prentice-Hall of India Ltd., New Delhi, 1987.				
Reference Books	1. Williams E. Boyce and Richard C. DI Prima, Elementary				
	differential equations and boundary value problems, John Wiley and				
	sons, New York, 1967.				
	2. George F Simmons, Differential equations with applications and				
	historical notes, Tata McGraw Hill, New Delhi, 1974.				
	3. N.N. Lebedev, Special functions and their applications, Prentice				
	Hall of India, New Delhi, 1965.				
	4. W.T. Reid. Ordinary Differential Equations, John Wiley and Sons,				
	New York, 1971				
	5. M.D.Raisinghania, Advanced Differential Equations, S.Chand&				
	Company Ltd. New Delhi 2001				
Website and	http://mathforum.org, http://ocw.mit.edu/ocwweb/Mathematics,				
e-Learning Source	http://www.opensource.org, www.mathpages.com				

Students will be able to

CLO1:Establish the qualitative behaviour of second order homogenous and non-homogenous differential equations.

CLO2:Understand the concept of homogenous and non – homogenous differential equations of order n.

CLO3: Analyse the n linear independent solution usingWronskian.

CLO4:Formulate the second order equations with regular singular points and Euler's equation.

CLO5:Establish the Bessel equation.

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

Objectives of the	To understand and apply the fundamental concepts in graph theory.				
Course Outline	UNIT-I :Basic Concepts: Graphs – Subgraphs – Degrees of vertices				
	– Paths and connectedness – Automorphism of asimple graph, Line				
	Graphs.Connectivity:Vertex cuts and Edge cuts – Connectivity and				
	edge – connectivity.				
	Chapter I: Section 1.2 – 1.7, Chapter III: Section 3.2 and 3.3				
	UNIT-II:Trees – Characterization and Simple properties-				
	Independent sets and Matchings:Vertex Independent sets and Vertex				
	Coverings – Edge-Independent Sets – Matchings andFactors,				
	Matchings in Bipartite Graphs (except the proof of Tutte's 1-factor				
	theorem).				
	Chapter IV: Section 4.2, Chapter V: Section 5.2 – 5.5				
	UNIT-III : Eulerian Graphs - Hamiltonian Graphs.				
	Chapter VI: Section 6.2 and 6.3				
	UNIT-IV :Graph Colorings: Vertex Colorings – Critical Graphs –				
	Brooks' Theorem.EdgeColorings of Graphs - Vizing's Theorem -				
	Chromatic Polynomials.				
	Chapter VII: Section 7.2, 7.3, 7.3.1, 7.6, 7.6.2, 7.9				
	UNIT-V:Planar Graphs:Planar and Nonplanar Graphs – Euler's				
	Formula and its Consequences – K5and K3,3areNonplanar graphs –				
	Dual of a Plane Graph – The Four Color Theorem and the Heawood				
	Five-Color Theorem.				
	Chapter VIII: Section 8.2 – 8.6				

Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	1. R. Balakrishnan and K. Ranganathan, A Textbook of Graph
	Theory(Universitext), Second Edition, Springer, New York, 2012.
Reference Books	1. Douglas B. West, Introduction to Graph Theory, Second Edition, PHI
	Learning Private Ltd, New Delhi, 2011.
	2. J.A. Bondy and U.S.R. Murty, Graph Theory, Springer, 2008.
	3. M.Murugan, Graph Theory and Algorithms, Second Edition, Muthali
	Publishing House, Annanagar, Chennai, 2018.
Website and	
e-Learning Source	

Students will be able to

CLO 1: Understand the basics of graph theory and their various properties.

CLO 2: Develop Models using graphs and to solve the problems algorithmically.

CLO 3: Apply graph theory concepts to solve real world applications like routing, TSP/traffic control, etc.

CLO 4: Analyse the significance of graph theory in different engineering disciplines.

CLO 5:Understand the applications of duality and planarity of graphs.

Outcome Mapping:

	POs					PSOs			
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

SEMESTER: I PART: A ELECTIVE –I		PROGRAMMING IN C++	Credit:3 Hours:5
Objectives of Course	the	 The main objective of this course are To learn the basic knowledge of C la requisites To enable the students to write the C classes, functions and interfaces To develop programming skills in C-oriented conceptsTomake application programs. 	nguage as pre- ++ programs using ++ with its object- as using C++
Course Outline		UNIT-I :Tokens, Expressions and Control Str Basic Concept of Object– Oriented Programmin Applications of OOP – Tokens, Expressions an Introduction – Tokens– Keywords – Identifie Basic Data Types – User Defined Data Types Derived Data Types – Symbolic Constants – T Declaration of Variables – Dynamic Initializa Reference variables – Operators in C++ – Operators – Operator Over Loading – Control St Chapter I (Sections: 1.5,1.6 and 1.8), Chapter 3.15, 3.23 and 3.25) UNIT-II:Functions C++ Introduction– The Main Function – Function F Reference – Return by Reference – Inline Arguments – Const Arguments – Recursion – Fu	ructure g- Benefits of OOP- nd Control Structure: ers and Constants - - Storage Classes - Type Compatibility - ation of Variables - - Scope Resolution tructures. • III (Sections: 3.1 to Prototyping - Call by Functions - Default unction over Loading
		– Friend and Virtual Functions – Math Library F Chapter IV (Sections: 4.1 to 4.12)	unctions.

	UNIT-III :Classes and Objects & Constructors and
	DestructorsClasses and Objects: Introduction - C Structures
	Revised – Specifying a Class – Defining MemberFunctions – C++
	program with class- Making an Outside Function Inline - Nesting of
	Member Functions – Private Member Functions – Arrays Within a
	Class – Arrays of Objects – Objects as Function Arguments –
	Friendly Functions.
	Constructors and Destructors: Introduction – Constructors –
	Parameterized Constructors – Multiple Constructors in a Class –
	Constructors with Default Arguments - Dynamic Initializations of
	Objects – Copy Constructors – Destructors.
	Chapter V (Sections: 5.1 to 5.9 and 5.13 to 5.15)
	Chapter VI (Sections: 6.1 to 6.7 and 6.11)
	UNIT-IV :Operator Overloading, Inheritance and Extending
	Class Operator Overloading: Introduction – Defining operators
	Overloading – Overloading Unary Operators – Overloading Binary
	Operators – Overloading Binary Operators Using Friends –
	Manipulating of Strings Using Operators – Rules for Overloading
	Operators.
	Inheritance and Extending Classes: Introduction – Defining
	Derived Classes – Single Inheritance – Making a Private Member
	Inheritable – Multilevel Inheritance – Multiple Inheritance –
	Hierarchical Inheritance – Hybrid Inheritance.
	Chapter VII (Sections: 7.1 to 7.6 and 7.8)
	Chapter VIII (Sections: 8.1 to8.8)
	UNIT-V:Streams and Working with files Streams: Introduction -
	C++ Streams – C++ Stream Classes.
	Working with files: Classes for File Stream Operations – Opening
	and Closing a File – Detecting End-of-File – File Modes – File
	Pointers and their Manipulations – Sequential Input and Output
	Operations – Random Access.
	Chapter X (Sections:10.1 to 10.3)
	Chapter XI (Sections: 11.1 to 11.8)
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /
internal component only,	others to be solved
Not to be included in the	(To be discussed during the Tutorial hour)
External Examination	
question paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill

Recommended Text	E. Balaguruswamy, Object – Oriented Programming with C++, 6 th Edition, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2013.
Reference Books	 Programming with C++ BY D. Ravichandran, Tata McGraw – Hill Publishing Company Limited New Delhi, 2006. Object – Oriented Programming with C++ by S.S Vinod Chandra, New age. H. Schildt, The Complete Reference of C++ , Tata – McGraw – Hill Publishing Company Limited, New Delhi, 2003.
Website and e-Learning Source	

Course Outcomes:

CO1:To understand the concepts of Tokens, Expressions and Control Structure

CO2:To learn how to write Functions in C++.

CO3:To learn how to designClasses and Objects & Constructors and Destructors Classes and Objects:

CO3:To learn how to overload operators, Inheritance and overloading of Extending Class Operator.

CO4:To understand the concept of Streams and Working with files Streams

	POs						PSOs			
	1	2	3	4	5	6	1	2	3	
CLO1	3	1	3	2	3	3	3	2	1	
CLO2	2	1	3	1	3	3	3	2	1	
CLO3	3	2	3	1	3	3	3	2	1	
CLO4	1	2	3	2	3	3	3	2	1	
CLO5	3	1	2	3	3	3	3	2	1	

Outcome Mapping:

Signature of the Subject Experts

SEMESTER: I	
PART: A	
ELECTIVE -I	

Objectives of the	1 Identify the release system as a second strain in the second se				
Course	2. Describestates deterministices deen				
	2. Describestates, deterministicandnon –				
	5. DifferentiatevariouslanguagesandthecorrespondingMachineswhichacc				
	eptsthem				
	4. Ascertainthelimitations of automata				
Course Outline	UNIT-I :Introductiontothetheoryof Computation:Three basic				
	concepts.				
	Finite automata: Deterministic Finite Accepters – Nondeterministic				
	Finite Accepters – Equivalence of deterministic and non-deterministic				
	finite accepters – reduction of the number of states in finite automata.				
	Chapter1 (1.2) , Chapter2(2.1–2.4)				
	UNIT-II :Regular Languages and Regular Grammars:				
	Regular Expressions-Connection between Regular Expressions and				
	Regular Languages – Regular Grammars.				
	Regular Languages – Regular Grammars. Chapter3(3.1–3.3)				
	UNIT-III : Properties of Regular Languages:				
	ClosurepropertiesofRegularLanguages-				
	Elementaryquestionsaboutregular languages-identifyingnon-				
	regularlanguages.				
	Chapter4(4.1–4.3)				
	UNIT-IV :ContextFreeLanguages:				
	ContextFreeGrammars(CFG).				
	Simplification of CFG and Normal Forms: Methods for				
	transforming Grammars-Two important Normal Forms.				
	Chapter 5 (5.1), Chapter6 (6.1, 6.2)				
	UNIT-V:PushdownAutomata:				
	PushdownAutomataandCFL–DeterministicPushdownAutomata andDeterministicCFL.				
	Properties of CFL: Two Pumping Lemmas.				
	Chapter 7(7.1–7.3), Chapter8(8.1)				

Extended Professional	Questions related to the above tonics from various competitive
	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / IRB / NET / UGC – CSIR / GATE / INPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	Contents and treatment as in
	An introduction to Formal Languages and Automataby Peter Linz,
	Athedition(2006) Narosa Publishing house
	4 edition(2000), Naiosa Publishing house.
Reference Books	1. Introduction to Automata Theory, Languages, and Computation by
	John E.Hopcroft,Rajeev
	Motwani and Jeffrey D.Ullman, 3 rd edition,Prentice Hall.
	2.A Course in Formal Languages, Automata and Groups by Ian
	M.Chiswell,1 st Edition,(2009),Springer
	3.Introduction to Languages and the Theory of Computation by John
	C Martin, 4 thedition(2010), McGraw-Hill.
	4. Introduction to Formal Languages, Automata Theory and
	Computation by Kamala Krithiyasan and Rama R (2009) Pearson
	5 Formal Languages and Automata by Rani Siromoney(1979) The
	Christian Literature
	Society.
Website and	
website and	
e-Learning Source	

Students will be able to

- CLO 1: Identifytheroleofswitchassimplenontrivialfiniteautomata
- CLO 2: Describestates, deterministic and non deterministic nature of transition
- CLO 3: DifferentiatevariouslanguagesandthecorrespondingMachineswhichacceptsthem
- CLO 4: Ascertainthelimitations of automata.
- CLO 5: Describe pushdownautomata.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

Title of the	e Course									
Paper Nur	nber		EC2-1							
Category	Generic		Year	Ι	Credits	3	Cou	rse		
	Elective		Semester	Ι			Cod	le		
Instruction	nal Hours		Lecture	Tuto	orial	Lab Prac	tice	Total		
per week								5		
Pre-requis	ite		-							
Objectives	of t	the	1. To	explore	the knowle	dge in Latt	ices ar	nd their a	pplications.	
Course			2. To	develop	application	s of switch	ning ci	rcuits.		
			3. To	unders	tand mathe	ematical re	easoni	ng in o	rder to read,	
			comprehen	d and co	onstruct ma	thematical	argum	ents.		
			4. To	develo	p mathema	itical foun	datior	ns to un	nderstand and	
			create math	nematica	al argument	s in crpto s	ystem	s.		
			5. To	motivat	e students	how to sol	lve pr	actical pr	roblems using	
			Discrete Mathematics.							
Course Outline			UNIT-I :Lattices							
			Properties and examples of Lattices – Distributive lattices – Boolean							
			algebras – Boolean polynomials – Minimal Forms of Boolean							
			Polynomials.							
			UNIT-II:Applications of Lattices							
			Switching Circuits - Applications of Switching Circuits - More							
			Applications of Boolean Algebras.							
			UNIT-III :Coding Theory							
			Introduction to Coding - Linear Codes - Cyclic Codes - Special							
			Cyclic Codes.							
			UNIT-IV :Cryptology							
			Classical Cryptosystems – Public key Cryptosystems – Discrete							
			Logarithms and other Ciphers.							
			UNIT-V:A	pplicat	ions of Alg	ebra				
			Semi-group	ps – Sei	ni-groups a	nd Automa	ata –S	emi-grou	ipsand Formal	
			Languages	–Semi-	groupsand]	Biology.				

Extended Professional	Questions related to the above tonics from various competitive
Extended Trofessional	Questions related to the above topics, nom various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Rudolf Lidl& Gunter Pilz. APPLIED ABSTRACT ALGEBRA,
	Springer Verlag, NewYork, Second Indian Reprint 2006.
Reference Books	1. J.P. Tremblay & R. Manohar, A First Course in Discrete
	Structures with Applications to Computer Science, McGraw Hill,
	1987.
	2. Kenneth H. Rosen, Discrete Mathematics and it's Applications,
	7th Edition/ McGraw Hill Education, New York, 2012.
	3. Liu C.L, Elements of Discrete Mathematics, McGraw Hill, New
	York, 1978.
Website and	
e-Learning Source	

CLO 1: Understand how Lattices can be used as a tool and mathematical model in the study of networks and circuits.

CLO 2: Construct mathematical arguments using logical connectives and quantifiers.

CLO 3: Apply codes to develop Mathematical Models.

CLO 4: Explore Applications of crypto systems in modern technology.

CLO 5: Learn how to work with some of the discrete structures which include semigroups and its applications.

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

SEMESTER: I
PART: A
ELECTIVE -II

FUZZY SETS AND THEIR APPLICATIONS

Objectives of the	Familiarize the students with the fundamentals of fuzzy sets,					
Course	operations on these sets and concept of membership function.					
	Familiar with fuzzy relations and the properties of these relations .To					
	know the concept of a fuzzy number and how it is defined. Become					
	aware of the use of fuzzy inference systems in the design of					
	intelligent systems					
Course Outline	UNIT-I :Fuzzy Sets					
	Fuzzy sets - Basic types - basic concepts - Characteristics -					
	Significance of the paradigm shift – Additional properties of α -cuts.					
	Chapter 1: 1.3 - 1.5 and Chapter 2: 2.1					
	UNIT-II:Fuzzy sets versus Crisp sets					
	Representation of fuzzy sets - Extension principle of fuzzy sets -					
	Operation on fuzzy sets – Types of operation – Fuzzy Complements.					
	Chapter 2: 2.2 - 2.3 and Chapter 3: 3.1 - 3.2					
	UNIT-III :Operations on Fuzzy sets					
	Fuzzy intersection – t-norms, fuzzy unions – t-conorms –					
	Combinations of operations.					
	Chapter 3: 3.3 - 3.5					
	UNIT-IV :Fuzzy Arithmetic					
	Fuzzy numbers - Linguistic variables - Arithmetic operation on					
	intervals – Arithmetic Operations on Fuzzy Numbers.					
	Chapter 4: 4.1 - 4.4					
	UNIT-V:Constructing Fuzzy Sets					
	Methods of construction on overview - direct methods with one					
	expert – direct methods with multiple experts – indirect methods with					
	multiple experts and one expert – Construction from sample data.					
	Chapter 10: 10.2 - 10.7.					
Extended Professional	Questions related to the above topics, from various competitive					
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /					
internal component	others to be solved					
only, Not to be included	(To be discussed during the Tutorial hour)					
in the External						
Examination question						
naper)						
Skills acquired from this	Knowledge Problem Solving Analytical ability Professional					
	Compotency Desfactional Communication and Transformality Claim					
course	Competency, Professional Communication and Transferrable Skill					
Recommended Text	G.J Klır and Bo Yuan, Fuzzy sets and Fuzzy Logic: Theory and					
	Applications, Prentice Hall of India Ltd, New Delhi, 2008.					

Reference Books	H.J Zimmemann, Fuzzy Set Theory and its Applications, Allied Publishers, Chennai, 1996.
	2. A.Kaufman, Introduction to the Theory of fuzzy subsets, Academic press, New York, 1975.
	3. V.Novak, Fuzzy Sets and Their Applications, Adam Hilger, Bristol, 1969.
Website and	
e-Learning Source	

Course Outcome: At the completion of the Course, the Students will able to

course ouree	incompletion of the course, the students with usite to
CLO1	Understand the concepts of Fuzzy sets and its types – Characteristics –
	Significance of the paradigm shift.
CLO2	Be able to distinguish between the crisp set and fuzzy set concepts
	through the learned differences between the crisp set characteristic
	function and the fuzzy set membership function.
CLO3	To know Fuzzy intersection – t-norms, fuzzy unions – t-conorms.
	Combinations of operations – Aggregation operations.
CLO4	Apply the concept of a fuzzy number and apply in real world problems
CLO5	Student practice to construct various methods of fuzzy sets using sample
	data.

Outcome Mapping:

	POs							PSOs		
	1	2	3	4	5	6	1	2	3	
CLO1	3	1	3	2	3	3	3	2	1	
CLO2	2	1	3	1	3	3	3	2	1	
CLO3	3	2	3	1	3	3	3	2	1	
CLO4	1	2	3	2	3	3	3	2	1	
CLO5	3	1	2	3	3	3	3	2	1	

Signature of the Subject Experts

SEMESTER: I PART: A Elective - II		MATHEMATICAL STATISTICS	Credit:3 Hours:5					
			<u> </u>					
Objectives of	the	1. To study random variables and its applica	tions.					
Course		2. To explore probability distributions.						
		3. To understand moments and their function	ns.					
		4. To introduce significance tests.						
		5. Concepts of ANOVA						
Course Outline		UNIT-I :Random Variables						
		The concepts of random variables - The distribution	ribution function -					
		Random variable of the discrete type and the	continuous type –					
		Functions of random variables – Margina	al distributions –					
		Conditional distributions – Independent random	variables.					
		UNIT-II:Some Probability Distributions						
		The Binomial Distribution – The Poisson I	Distribution – The					
		Uniform Distribution – The Normal Distribution	ion – The Gamma					
		Distribution – The Beta Distribution.						
		UNIT-III :Sample Moments and Their Functi	ons					
		Notion of a sample and a statistic - Distributio	n of the arithmetic					
		mean of independent normally distributed random variables – The						
		χ^2 -distribution – The distribution of the statistics (\overline{X} , S) – Student's t						
		- distribution - Fisher's Z – distribution.						
		UNIT-IV :Significance tests						
		Concept of a statistical test – Parametric tests for small samples						
		large samples - χ^2 test - Tests of Kolmogorov a	and Smirnov type -					
		Independence Tests by contingency tables.						
		UNIT-V:Analysis of Variance						
		One-way Classification and two-way Classific	ation. Hypotheses					
		Testing: The Power functions and OC function	n – Most Powerful					
		test – Uniformly most powerful test – unbiasedte	sts.					

Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC
internal component	/ others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	M. Fisz ,Probability Theory and Mathematical Statistics, John
	Wiley and sons, New Your, 1967.
Reference Books	1. E.J.Dudewicz and S.N.Mishra ,Modern Mathematical
	Statistics, John Wiley and Sons, New York, 1988.
	2. V.K.RohatgiAn Introduction to Probability Theory and
	Mathematical Statistics, Wiley Eastern New Delhi,
	1988(3rd Edn).
	3. B.L.VanderWaerden, Mathematical Statistics, G.Allen&
	Unwin Ltd., London, 1968.
Website and	
e-Learning Source	

After completion of this course the student will be able to

CLO 1: Apply the concepts of random variables in real life situations.

CLO 2: Identify the type of statistical situation to which different distributions can be applied.

CLO 3: Calculate moments and their functions.

CLO 4: Explore knowledge in the various significance tests for statistical data.

CLO 5: Analyze statistical data using ANOVA.

Outcome Mapping:

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

SEMESTED. H		T
PART: A	ADVANCED ALGEBRA	Credit:5
CORE COURSE –		nours:0
IV		

Objectives of the	To study field extension, roots of polynomials, Galois Theory, finite					
Course	fields, division rings, solvability by radicals and to develop					
	computational skill in abstract algebra.					
Course Outline	UNIT-I :Extension fields – Transcendence of e.					
	Chapter 5: Section 5.1 and 5.2					
	UNIT-II: Roots or Polynomials More about roots					
	Chapter 5: Sections 5.3 and 5.5 (Omit 5.4)					
	UNIT-III : Elements of Galois theory.					
	Chapter 5 : Section 5.6					
	UNIT-IV : Finite fields - Wedderburn's theorem on finite division					
	rings.					
	Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)					
	UNIT-V : A theorem of Frobenius - Integral Quaternions and the Four					
	- Square theorem.					
	Chapter 7 : Sections 7.3 and 7.4					
	Chapter 7 : Sections 7.3 and 7.4					
Extended	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive					
Extended Professional	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /					
Extended Professional Component (is a part	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved					
Extended Professional Component (is a part of internal	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Extended Professional Component (is a part of internal component only,	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Extended Professional Component (is a part of internal component only, Not to be included	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Extended Professional Component (is a part of internal component only, Not to be included in the External	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) Skills acquired from	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) Skills acquired from this course	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) Skills acquired from this course Recommended	Chapter 7 : Sections 7.3 and 7.4 Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill I.N. Herstein. <i>Topics in Algebra</i> (II Edition) Wiley EasternLimited,					

Reference Books	1. M.Artin, Algebra, Prentice Hall of India, 1991.
	2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, Basic Abstract
	Algebra (II Edition) Cambridge University Press, 1997. (Indian
	Edition)
	3. I.S.Luther and I.B.S.Passi, Algebra, Vol. I –Groups(1996); Vol. II
	Rings, Narosa Publishing House, New Delhi, 1999
	4. D.S.Malik, J.N. Mordeson and M.K.Sen, Fundamental of Abstract
	Algebra, McGraw Hill (International Edition), New York. 1997.
	5. N.Jacobson, Basic Algebra, Vol. I & II Hindustan Publishing
	Company, New Delhi.
Website and	, http://ocw.mit.edu/ocwweb/Mathematics,
e-Learning Source	http://www.opensource.org, www.algebra.com

Students will be able to

CLO1:Demonstrate the knowledge and understanding of fundamental concepts including extension fields.

CLO2:Find the nth root of polynomials.

CLO3:Compose clear and accurate proofs using the concepts of Galois Theory.

CLO4:Bring out insight into finite field and division ring.

CLO5:Understand the four square theorem.

Outcome Mapping:

	POs				PSOs				
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

SEMESTER: II PART: A CORE COURSE –	REAL ANALYSIS - II	Credit:5 Hours:6
V		

Objectives of the	To introduce measure on the real line, Lebesgue measurability and						
Course	integrability, Fourier Series and Integrals, in-depth study in						
	multivariable calculus.						
Course Outline	UNIT-I :Measure on the Real line - Lebesgue Outer Measure -						
	Measurable sets - Regularity - Measurable Functions - Borel and						
	Lebesgue Measurability						
	Chapter – 2: Sections 2.1 to 2.5 (de Barra)						
	UNIT-II : Integration of Functions of a Real variable - Integration of						
	Non- negative functions - The General Integral - Riemann and Lebesgue						
	Integrals						
	Chapter – 3: Sections 3.1,3.2 and 3.4 (de Barra)						
	UNIT-III : Fourier Series and Fourier Integrals - Introduction -						
	Orthogonal system of functions - The Fourier series of a function						
	relative to an orthonormal system - Properties of Fourier Coefficients -						
	The Riesz-Fischer Thorem - The convergence and representation						
	problems in for trigonometric series - The Riemann - Lebesgue Lemma						
	- The Dirichlet Integrals - An integral representation for the partial						
	sums of Fourier series - Riemann's localization theorem - Sufficient						
	conditions for convergence of a Fourier series at a particular point -						
	Consequences of Fejes's theorem - The Weierstrass approximation						
	theorem						
	Chapter 11 : Sections 11.1 – 11.12,11.14 &11.15 (Apostol)						
	UNIT-IV : Multivariable Differential Calculus - Introduction - The						
	Directional derivative - Directional derivative and continuity - The total						
	derivative - The total derivative expressed in terms of partial derivatives						
	- The matrix of linear function - The Jacobian matrix - The chain rule -						
	Matrix form of chain rule - The mean - value theorem for differentiable						
	functions - A sufficient condition for differentiability - A sufficient						
	condition for equality of mixed partial derivatives - Taylor's theorem for						
	functions of \mathbb{R}^n to \mathbb{R}^1						
	Chapter 12 : Sections 12.1 – 12.14 (Omit 12.6) (Apostol)						
	UNIT-V : Implicit Functions and Extremum Problems : Functions						
	with non-zero Jacobian determinants - The inverse function theorem-						
	The Implicit function theorem-Extrema of real valued functions of						
	severable variables-Extremum problems with side conditions.						
	Chapter 13 : Sections 13.2 – 13.4, 13.6 and 13.7 (Apostol)						

Extended	Questions related to the above topics, from various competitive
Professional	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC /
Component (is a part	others to be solved
of internal	(To be discussed during the Tutorial hour)
component only, Not	
to be included in the	
External	
Examination	
question paper)	
Skills acquired from	Knowledge, Problem Solving, Analytical ability, Professional
this course	Competency, Professional Communication and Transferrable Skill
Recommended	1. G. de Barra, Measure Theory and Integration, Newage International
Text	Ltd., New Delhi, 2006. (for Units I and II)
	2. Tom M.Apostol : <i>Mathematical Analysis</i> , 2 nd Edition.
	NarosaPublishing Company Inc. New Delhi, 2002. (for Units III, IV
	and V)
Deferrer De der	1 Deskill LC That design in the control of the University Design
Kelerence Books	1. Burkin, J.C. <i>TheLebesgue Integral</i> , Cambridge University Press,
	1951. 2 Murroe M.F. Maggung and Integration Addison Wesley Magg 1071
	2. Multioe, M.E. Measure and Integration. Addison-westey, Mass. 1971.
	5. Roydon, H.L. <i>Real Analysis</i> , Machiman Fub. Company, New Fork,
	1700. A Budin W Principles of Mathematical Analysis McGrow Hill
	Company New York 1979
	5 Malik S C and Savita Arora Mathematical Analysis Wiley Eastern
	J. Mank, S.C. and SavhaAlora. <i>Muthemutical Analysis</i> , whey Eastern
	6 Saniay Arora and Bansil al Introduction to Real Analysis
	SatvaPrakashan. New Delhi 1991
Website and	http://mathforum.org. http://ocw.mit.edu/ocwweb/Mathematics
e-Learning Source	http://www.opensource.org

Students will be able to

CLO1:Understand and describe the basic concepts of measure on real line.

CLO2:Analyse the integration of functions of a real variable.

CLO3: Analyse and evaluate the Fourier series and Fourier Integrals with respect to the orthonormal system.

CLO4:Formulate and evaluate the multi variable differential calculus.

CLO5:Analyse the inverse and implicit functions.

			PO	Os				PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

SEMESTER: II PART: A CORE COURSE – VI VI CORE COURSE – VI	4
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Objectives of the	To classify the second order partial differential equations and to study					
Course	Cauchy problem, method of separation of variables, boundary value					
	problems.					
Course Outline	UNIT-I :Mathematical Models and Classification of second order					
	equation : Classical equations-Vibrating string – Vibrating membrane –					
	waves in elastic medium - Conduction of heat in solids - The					
	Gravitational potential.					
	Chapter 3 : Sections 3.1 to 3.6					
	UNIT-II : Classification of second order equation :Second order					
	equations in two independent variables - canonical forms - equations					
	with constant coefficients – general solution					
	Chapter 4 : Sections 4.1 to 4.4					
	UNIT-III :Method of separation of variables: Separation of variable-					
	The Vibrating string problem – Existence and uniqueness of solution of					
	vibrating string problem- Heat conduction problem - Existence and					
	uniqueness of solution of heat conduction problem – The Laplace and					
	beam equations					
	Chapter 7 : Sections 7.2 to 7.7					
	UNIT-IV: Boundary Value Problems : Boundary value problems –					
	Maximum and minimum principles – Uniqueness and continuity					
	theorem – Dirichlet Problem for a circle, a circular annulus, a rectangle					
	- Dirichlet problem involving Poisson equation - Neumann problem for					
	a circle and a rectangle.					
	Chapter 9 : Sections 9.1 to 9.9					
	UNIT-V : Green's Function: The Dirac Delta function – Properties of					
	Green's function – Method of Green's function – Dirichlet Problem for					
	the Laplace and Helmholtz operators - Method of images and eigen					
	functions.					
	Chapter 11 : Section 11.2 to 11.8					

Extended	Questions related to the above topics, from various competitive						
Professional	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC /						
Component (is a part	others to be solved						
of internal	(To be discussed during the Tutorial hour)						
component only, Not							
to be included in the							
External							
Examination							
question paper)							
Skills acquired from	Knowledge, Problem Solving, Analytical ability, Professional						
this course	Competency, Professional Communication and Transferrable Skill						
Recommended	1. TynMyint-U and LokenathDebnath, Linear Partial Differential						
Text	Equations for Scientists and Engineers (Fourth Edition), North						
	Hollan, New York, 2007.						
Reference Books	1. M.M.Smirnov, Second Order partial Differential Equations,						
	Leningrad, 1964.						
	2. I.N.Sneddon, <i>Elements of Partial Differential Equations</i> , McGraw						
	Hill, New Delhi, 1983.						
	3. R. Dennemeyer, Introduction to Partial Differential Equations and						
	Boundary Value Problems, McGraw Hill, New York, 1968.						
	4. M.D.Raisinghania, Advanced Differential Equations, S.Chand&						
	Company Ltd., New Deini, 2001.						
	5. S, Sankarkao, <i>Partial Differential Equations</i> , 2 Edition, Prentice						
Wahaita and	http://mathforgum.org. http://acuumit.adu/acuumuch/Mathamatica						
website and	<u>nup://mainforum.org, nup://ocw.mit.edu/ocwweb/iviainematics</u> ,						
e-Learning Source	http://www.opensource.org, www.mathpages.com						

Students will be able to

CLO1:To solve heat conduction problems in solids.

CLO2:To analyse the classification of second order equation.

CLO3:To solve Vibrating string problem, Heat conduction problem, to identify and solve Laplace and beam equations

CLO4:To apply maximum and minimum principle's and solve Dirichlet, Neumann problems for various boundary conditions

CLO5:To apply Green's function and solveDirichlet, Laplace problems, to apply Helmholtz operation and to solve Higher dimensional problem

			PO	Os				PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

SEMESTER: II
PART: A
Elective - III

Objectives of the	To introduce the ideas of algebraic topology to other branches of			
Course	Mathematics.			
Course Outline	UNIT – I : CALCULUS IN THE PLANE: PATH INTEGRALS			
	Angles and Deformations – Differential forms and path Integrals –			
	Independence of Path –Criterion for exactness. Angles and			
	Deformations: Angle functions and Winding numbers			
	– Reparametrizing and Deforming the Paths. Winding Numbers:			
	Definition – Homotopyand Reparametrization – Varying the point –			
	Degrees and Local Degrees.			
	Chapter -1 : (a) to (c); Chapter -2 : (a) to (b); Chapter -3 : (a) to (d)			
	UNIT – II: COHOMOLOGY AND HOMOLOGY			
	De RhamCohomology and the Jordan Curve Theorem. Definition of			
	the De RhamGraphs - The Coboundary map - the Jordon Curve			
	Theorem – Applications and Variations.			
	Homology: Chains, Cycles, and H0U – Boundaries, H1U, and			
	Winding Numbers - Chainson Grids - Maps and Homology - The			
	First Homology Group for General Spaces.			
	Chapter 5: (a) to (d); Chapter 6: (a) to (e)			
	UNIT – III: HOLES AND INTEGRALS			
	Multiply connected regions - Integrations over continuous Paths and			
	Chains – Periods ofIntegrals – Complex Integration.			
	Mayer - Victoris: The Boundary map - Mayer - Victoris for			
	Homology - Variations and applications - Mayer - Victoris for			
	Cohomology.			
	Chapter 9: (a) to (d); Chapter 10: (a) to (d)			
	UNIT – IV: COVERING SPACES AND FUNDAMENTAL			
	GROUPS			
	Covering spaces: Definition – Lifting paths and Homotopies – G-			
	coverings – CoveringTransformations.			
	The Fundamental Groups: Definitions and Basic Properties -			
	Homotopy – Fundamental group and Homology.			
	Fundamental Groups and Covering Spaces: Fundamental Group			
	and Coverings – Automorphisms of Coverings – TheUniversal			
	Covering – Coverings and Subgroups of the Fundamental Group.			
	Chapter 11: (a) to (d); Chapter 12: (a) to (c); Chapter 13: (a) to (d)			

	UNIT – V: THE VAN KAMPEN THEOREM
	G-Coverings from the Universal Covering - Patching Coverings
	together – The VanKampen Theorem.
	Cohomology: Patching Coverings and Cechcohomology -
	CechCohomology andHomology – De RhamCohomology and
	Homology – Proof of Mayer – Victorisfro DeRhamCohomology.
	Chapter 14: (a) to (d); Chapter 15: (a) to (d)
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	William Fulton, Algebraic Topology - A First Course, Springer -
	Verlag, NewYork, 1995.
Reference Books	1. M. K. Agoston, Algebraic Topology – A First Course. Marcel
	Dekker, 1992.
	2. SatyaDeo, Algebraic Topology, Hindustan Book Agency, New
	Delhi, 2003.
	3. M. Greenberg and Harper, Algebraic Topology – A First Course,
	Benjamin /
	Cummings, 1981.
	4. C. F. Maunder, Algebraic topology, Van Nastrand, New York,
	1970.
	5. J. R. Munkres, Topology, Prentica Hall of India, New Delhi, 2002,
	[3rd Indian Print]
Website and	
e-Learning Source	

Students will be able to

CLO1- Understand the concepts of Calculus in the plane.

CLO2- Understand the concepts cohomology and homology.

CLO3 –Understand holes integralsand Homology.

CLO4 -Analyse covering spaces and fundamental groups.

CLO5- EstablishG-Coverings from the Universal Covering, Patching Coverings

together, The VanKampen Theorem, Cohomology.

			Po	Os				PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

Objectives of the	The main purpose of the course is to introduce students to understand				
Course	the subject of differential geometry, where you talk about manifolds,				
	one difficulty is that the geometry is described by coordinates, but the				
	coordinates do not have meaning. They are allowed to undergo				
	transformation. And in order to handle this kind of situation, an				
	important tool is the so-called tensor analysis, which was new to				
	mathematicians.				
Course Outline	Unit I: Tensor Algebra				
	Systems of different orders – Summation convention – Kronecker				
	symbols - Transformation of coordinates in Sn. Invariants - Covariant				
	and Contravariant vectors - Tensors of second order -Mixed tensors -				
	Zero tensors – Tensor field – Algebra of tensors – Equality of tensors –				
	Symmetric and Skew -Symmetric tensors - Outer multiplication,				
	Contraction and Inner multiplication – Quotient Law of tensors –				
	Reciprocal tensor of tensor - Relative tensor - Cross product of				
	vectors.				
	Chapter 1: 1.1 – 1.3,1.7 & 1.8, Chapter 2: 2.1 – 2.9(Text Book -1)				
	Unit II: Tensor Calculus				
	Riemannian space – Christoffel symbols and their properties.				
	Chapter 3: 3.1 – 3.2(Text Book -1)				
	Unit III: Tensor Calculus (Contd)				
	Covariant differentiation of tensors – Riemann-Christoffel curvature				
	tensor – Intrinsic differentiation.				
	Chapter 3: 3.3 – 3.5 (Text Book -1)				
	Unit IV: Special Theory of Relativity				
	Galilean transformation – Maxwell's equations – The Ether theory –				
	The principle of Relativity.				
	Relativistic Kinematics: Laurent's transformation equations – Events				
	and simultaneity –Example – Einstein train – Time dilation –				
	Longitudinal contraction – Invariant interval – Proper time and proper				
	distance – World line – Example – Twin paradox – Addition of				
	velocities –Relativistic Doppler effect.				
	Chapter 7: 7.1 – 7.2 (Text Book -2)				

	Unit V: Relativistic Dynamics
	Momentum – Energy – Momentum-Energy four vector – Force –
	Conservation of energy – Mass and energy – Example – Inelastic
	collision – Principle of equivalence – Lagrangian and Hamiltonian
	formulations.
	Accelerated Systems: Rocket with constant acceleration – Example –
	Rocket with constant thrust.
	Chapter 7: 7.3 – 7.4(Text Book -2)
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	1.U.C. De, Absos Ali Shaikh&JoydeepSengupta, Tensor Calculus,
	Narosa Publishing House, New Delhi, 2004.
	2. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.
Reference Books	1. J.L. Synge &A. Schild, Tensor Calculus, Toronto, 1949.
	2. A.S. Eddington, The Mathematical Theory of Relativity, Cambridge
	University Press,1930.
	3. P.G. Bergman, An Introduction to Theory of Relativity, New York,
	1942.
	4. C.E. Weatherburn, Riemannian geometry and The Tensor Calculus,
	Cambridge, 1938.
Website and	
e-Learning Source	

Students will be able to

CLO1-Understand Tensor Algebra terminologies and different orders – Summation convention– Kronecker symbols – Transformation of coordinates in Sn. Invariants – Covariant and Contravariant vectors and arithmetic's law related to tensor.

CLO2 - Discuss the Riemannian space - Christoffel symbols and their properties.

CLO3 -Tensor calculus fundamentals on covariant differentiation of tensors - Riemann

Christoffel curvature tensor - Intrinsic differentiation are carried out.

CLO4 -Focus on special theory of relativity concepts of Laurent's transformation equations, Einstein train – Time dilation – Longitudinal contraction – Invariant interval – Twin paradox. CLO5- Study the application of theory relativistic dynamics on Momentum-Energy four vector-Force – Conservation of energy – Principle of equivalence – Lagrangian and Hamiltonian formulations.

			PO	Os				PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Outcome Mapping:

Signature of the Subject Experts

Objectives of the	1. To enlighten the students in the field of operations research
Course Of the	2 To help the students to apply OR techniques in business and management
Course	2. To help the students to appry OK teeningdes in ousness and management
	3 To provide a mathematical programming for finding applications in
	diverse fields including engineering, computer science and economics
Course Outline	UNIT L data and the second s
Course Outline	UNIT-I :Integer programming algorithms –Branch and bound algorithm-
	cutting plane algorithm-computational considerations in $ILP - travening$
	salesman problem $-B & B$ solution algorithm $-$ cutting plane algorithm.
	Chapter 9, Sections 9.2.1 to 9.2.3, 9.3.2, 9.3.3 (Omit 9.3.1)
	UNIT-II:Dynamic programming – Recursive nature of computations in
	DP – forward and backward recursion – knapsack/fly away/cargo – loading
	model – work force size model – equipment replacement model.
	Chapter 10, Sections 10.1 to 10.3, 10.3.1 to 10.3.3
	UNIT-III :Decision analysis and Games – Decision making under
	certainty – analytic hierarchy process – decision under uncertainty – game
	theory - optimal solution of two person zero sum games - solutions of
	mixed strategy games.
	Chapter 13, Sections 13.1, 13.3, 13.4, 13.4.1,
	13.4.2.,3.4.3
	UNIT-IV :Classical optimization theory – unconstrained problems –
	necessary and sufficient conditions - the Newton Raphson method -
	constrained problems - equality constraints - inequality constraints -
	Karush Kuhn Tucker conditions
	Chapter 18, Sections 18.1, 18.1.1, 18.1.2, 18.2, 18.2.1, 18.2.2.
	UNIT-V: Non-Linear Programming algorithms – unconstrained algorithms
	- direct search method - gradient method - constrained algorithms -
	seperable programming – quadratic programming.
	Chapter 19, Sections 19.1, 19.1.1, 19.1.2, 19.2, 19.2.1, 19.2.2
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	Hamdy A. Taha, Operations Research (8thEdn.), Pearson Prentice Hill
	Publications, 2009.

Reference Books	[1]O.L. Mangasarian, Non Linear Programming, McGraw Hill, New York.					
	[2]Mokther S. Bazaraa and C.M. Shetty, Non Linear Programming,					
	Theoryand Algorithms,					
	Willy, New York.					
	[3] Prem Kumar Gupta and D.S. Hira, Operations Research : An					
	Introduction ,S. Chand and					
	Co., Ltd. New Delhi.					
	[4]S.S. Rao, Optimization Theory and Applications, Wiley Eastern Limited,					
	New Delhi.					
Website and						
e-Learning Source						

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

- **CO1:** Ability to apply the theory of optimization methods and algorithms to develop and For solving various types of optimization problems.
- **CO2:** Ability to go in research by applying optimization techniques in real value problems
- **CO3:** Analyze decision making under certainty and uncertainty by game theory.
- **CO4:** Establish the constrained and unconstrained problems using Karush and Kuhn-tucker conditions and Newton Raphson Method.
- **CO5:**Focus on Non linear programming algorithms in quadratic programming.

		POs					PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Outcome Mapping:

Signature of the Subject Experts

SEMESTER: II		Cradit:3
PART: A	WAVELETS	Hours:4
Elective - IV		110013.4

Objectivesof	the	To introduce the basic notions and techniques of Wavelets Theory			
Course		and to establish the Concepts to understand and use wavelets from			
		Fourier to wavelet analysis.			
Course Outline		Unit I : An Overview			
		Fourier analysis to wavelet analysis - Integral Wavelet Transform			
		and Time-frequency analysis - Inversion formulas and duals -			
		Classification of Wavelets –Multiresolution analysis - Splines and			
		Wavelets – Wavelet decompositions and reconstructions.			
		Chapter 1: Sections 1.1 to 1.6			
		Unit II : Fourier Analysis			
		Fourier and Inverse Fourier Transforms – Continuous-time			
		convolution and the delta function - Fourier Transform of square-			
		integrable functions- Fourier Series - Basic Convergence Theory -			
		Poisson Summation Formula.			
		Chapter 2: 2.1 and 2.5			
		Unit III : Wavelet Transforms & Time Frequency Analysis			
		The Gabor Transform – Short-time Fourier Transforms and the			
		uncertainty principle - The integral Wavelet Transform - Dyadic			
		Wavelets and Inversions - Frames - Wavelet Series.			
		Chapter 3: Section 3.1 to 3.6			
		Unit IV : Cardinal Spline Analysis			
		Cardinal Spline spaces. – B-Splines and their basic properties - The			
		two-scale relation and an interpolatory graphical display algorithm			
		- B-Net representations and computation of cardinal splines -			
		Construction of cardinal splines - construction of spline application			
		formulas - Construction of Spline interpolation formulas.			
		Chapter 4: Sections 4.1 to 4.6			
		Unit V: Scaling Functions And Wavelets			
		Multiresolution analysis - Scaling functions with finite two scale			
		relations – Direction sum Decompositions of L 2 (R) - Wavelets			
		and their duals.			
		Chapter 5: Sections 5.1 to 5.4			

Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC - CSIR / GATE / TNPSC
internal component	/ others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	Charles K.Chui , An Introduction to Wavelets, Academic Press,
	New York, 1992.
Reference Books	1. Chui. C.K. (ed) Approximation theory and Fourier Analysis,
	Academic Press Boston, 1991.
	2. Daribechies, I. Wavelets, CBMS-NSF Series in Appl math.
	SIAM. Philadelphia, 1992.
	3. Schumaker, L.L. Spline Functions: Basic Theory , Wiley, New
	York 1981.
Website and	
e-Learning Source	

Students will be able to

CLO1: Understand the terminologies that are used in the wavelets, from Fourier analysis to wavelet analysis.

CLO2: Determine the concepts of the Fourier and Inverse Fourier Transforms.

CLO3: know the Wavelet Transforms and Time Frequency Analysis.

CLO4: Learn the concepts on Cardinal Spline Analysis.

CLO5: Study the Scaling Functions and Wavelets theory.

Outcome Mapping:

	POs							PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

Objectives of the	To study the mathematical models through ODE and difference					
Course	equations and to train the students to get essential knowledge to					
	develop mathematical models in real life problems.					
	······································					
Course Outline	Unit-I: Mathematical Modelling through Ordinary Differential					
	Equations of First Order					
	Mathematical Modelling through Differential Equations- Linear					
	Growth and Decay Models-Non- Linear Growth and Decay Models-					
	Compartment Models- Mathematical Modelling in Dynamics					
	Through Ordinary Differential Equations of First Order-					
	Mathematical Modelling of Geometrical Problems Through Ordinary					
	Differential Equations of First Order.					
	Chapter 2: Sections 2.1 – 2.6					
	Unit – II: Mathematical Modelling through Systems of					
	Ordinary Differential Equations of the First Order: Mathematical					
	Modelling in Population Dynamics- Mathematical Modelling of					
	Epidemics Through Systems of Ordinary Differential Equations of					
	First Order- Compartment Models through Systems of Ordinary					
	Differential Equations					
	Chapter 3: Sections 3.1 – 3.3					
	Unit – III:Mathematical Modelling through Systems of Ordinary					
	Differential Equations of the First Order: Mathematical					
	Modelling in Economics through Systems of Ordinary Differential					
	Equations of First Order- Mathematical Models in Medicine, Arms					
	Race, Battles and International Trade in Terms of Systems of					
	Ordinary Differential Equations- Mathematical Modelling in					
	Dynamics Through Systems of Ordinary Differential Equations of					
	First Order.					
	Chapter 3: Sections 3.4 – 3.6					

	Unit-IV: Mathematical Modelling Through Difference Equations.
	Basic Theory of Linear Difference Equations With Constant
	Coefficients- Mathematical Modelling through Difference Equations
	in Economics and Finance- Mathematical Modelling through
	Difference Equations in Population Dynamics and Genetics-
	Mathematical Modelling through Difference Equations in
	Probability Theory
	Chapter 5: Sections 5.2 – 5.5
	Unit-V: Mathematical Modelling Through Functional Integral,
	Delay –Differential and Differential- Difference Equations
	Mathematical Modelling Through Functional Equations-
	Mathematical Modelling Through Integral Equations-
	Chapter 8: Sections 8.1 and 8.2
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	J.N.Kapur, Mathematical Modelling, New Age International
	Publishers, New Delhi, 2005.
Reference Books	1. D.J.G.James and J.J.Macdonald, Casestudies in Mathematical
	Modelling, StanlyThames,Cheltonham.
	2. M.Cross and A.O.Moscreadini, The art of Mathematical Modelling, Ellighterwood and John Wiley
	3 C Dyson Elvery Principles of Mathematical Modelling
	AcademicPress, NewYork.
	4. D.N.Burghes, Modelling with Difference Equations, EllisHarwood
	and John Wiley.
Website and	http://www.mathfoundation.com
e-Learning Source	

Students will be able to

CLO1: To learn the concepts of Mathematical Modelling Techniques.

CLO2: To understand the ideas of Mathematical Modelling through ODE of first order.

- CLO3: To develop the Mathematical Models through systems of ODE of first order.
- CLO4: To know the techniques of Mathematical Modelling through Difference equations.
- CLO5: To study the Mathematical Models through Differential Difference equations

			PSOs						
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

Objectivesof	the	To know the knowledge about fluid particles in steady and unsteady						
Course		compressible and incompressible flows.						
		To provide the basic knowledge of two and three dimensional						
		potential flows.						
Course Outline		Unit – I: Kinematics of fluid in motion:						
		Real fluids and ideal fluids – Velocity of a fluid at a point –						
		Streamlines and path lines; steady and unsteady flows – The velocity						
		potential – The Vorticity vector – Local and particle rates of change – The equation of continuity – Worked examples – Acceleration of a						
		The equation of continuity – Worked examples – Acceleration of a luid – Pressure at a point in a fluid at rest – Pressure at a point in						
		luid – Pressure at a point in a fluid at rest – Pressure at a point in noving fluid – Conditions at a boundary of two inviscid Immiscible						
		moving fluid – Conditions at a boundary of two inviscid Immiscible						
		Hunds.						
		Unit - I : Chapter II, Sections2.1 to 2.9 and						
		Unit – II: Equations of motion of a fluid: Euler's equations of						
		Cint – II. Equations of motion of a numerical sequations of						
		motions – Bernoulli's equation – Worked examples – Some flows						
		involving axial symmetry – Some special two – dimensional flows.						
		Some three – dimensional flows: Introduction – sources, sinks and						
		doublets – Axi – symmetric flows; Stokes stream function.						
		Unit - II : Chapter III, Sections 3.4 to 3.6, 3.9, 3.10						
		Chapter IV, Sections 4.1, 4.2, 4.5						
		Unit – III: Some two – dimensional flows: Meaning of a two –						
		dimensional flow – Use of cylindrical polar coordinates – The stream						
		function – The complex potential for two – dimensional, irrotational,						
		incompressible flow - Complex velocity potentials for standard two						
		dimensional flows – Some worked examples.						
		Unit - III : Chapter V, Sections 5.1 to 5.6						
		Unit – IV: Viscous flow: Stress components in real fluid – Relations						
		between Cartesian components of stress - Translational motion of						
		fluid element - The rate of strain quadric and principal stresses -						
		Some further properties of the rate of strain quadric.						
		Unit - IV : Chapter VIII, Sections 8.1to8.5						

	Unit - V: The coefficient of viscosity and Laminar flow - The
	Navier - Stokes equations of motions of a viscous fluid - Some
	solvable problems in viscous flow – Steady viscous flow in tubes of
	uniform crass section.
	Unit - V : Chapter VIII, Sections 8.8 to 8.12 except 8.8.4
Extended Professional	Questions related to the above topics, from various competitive
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /
internal component	others to be solved
only, Not to be included	(To be discussed during the Tutorial hour)
in the External	
Examination question	
paper)	
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional
course	Competency, Professional Communication and Transferrable Skill
Recommended Text	F.Charlton, Content and Treatment as in Text Book of Fluid
	Dynamics, CBS Publishers and Distributors, New Delhi, 1985.
Reference Books	
Website and	
e-Learning Source	

Students will be able to

CLO1 –Derive the path lines and the streamlines in Cartesian and polar form from a velocity field.

CLO2–Derive the stream function form a velocity field.

CLO3 – Model different flows from a combination of uniform flows, sources, sinks, and doublets.

CLO4 –Use the continuity equation to determine whether an **in-viscous** flow is incompressible.

CLO5 – Understand the Navier – Stoke's Equations of motions of viscous fluid.

	POs							PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts

SEMESTER: II	MATHEMATICAL DOCUMENTATION USING	Credit. 2
PART. R	WATHEMATICAL DOCUMENTATION USING	Creuit.2
	LATEX	Hours:4

	41	
Objectivesof	the	Inculcate the computer knowledge. Introduce the Lalexsoftware
Course		Train in the Preparation of Project and dissertations using LaTex.
		Educate the Latex coding.Understand the concepts of Cross
		References, Footnotes, Margin pars and Endnotes.
Course Outline		Unit – I
		Basic Document and Bibliography
		What is LATEX – Simple typesetting – Fonts Type size –
		Document class - page style - page numbering - Formatting lengths
		– parts of a document – Dividing the document – what next? –
		Introduction – natbib – The BIBTEX program – BIBTEX Style files
		– Creating a bibliographic database.
		Chapter: 1 to 4
		Unit – II
		Contents, Index, Glossary, Text, Row and Column
		Table of contents – Index – Glossary. Borrowed words – Poetry in
		typing – Making lists – When order matters – Description and
		definitions.
		Chapter: 5 to 6
		Unit – III
		Typesetting Equations and Theorems
		Keeping tabs – Tables – The basics – Custom commands – More on
		mathematics – mathematics miscellany – New operations– The
		many fact of mathematics – Symbols – Theory in LATEX –
		Designer theorem-the amsthm package – Housekeeping.
		Chapter: 7 to 9
		Unit – IV
		Several Kinds of boxes and Floats,
		LR boxes – Paragraph boxes – Paragraph boxes with specific height
		– Nested boxes – Role boxes – The figure environment – The table
		environment.
		Chapter: 10 to 11

	Unit – V					
	Cross References in LATEX, Footnotes, Marginpars and Endnotes					
	Why cross reference? – Let LATEX do it – Pointing to a page-the					
	package varioref – Pointing outside-the package xr – Lost the keys?					
	Use lables.tex – Footnotes – Marginal notes – Endnotes.					
	Chapter: 12 to 13					
Extended Professional	Questions related to the above topics, from various competitive					
Component (is a part of	examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC					
internal component	/ others to be solved					
only, Not to be included	(To be discussed during the Tutorial hour)					
in the External						
Examination question						
paper)						
Skills acquired from this	Knowledge, Problem Solving, Analytical ability, Professional					
course	Competency, Professional Communication and Transferrable Skill					
Recommended Text	A Primer, Latex Tutorials, Indian TEX users group, Trivandrum,					
	India.					
	www.tug.org.in					
Reference Books	1. Peter Flynn, A beginner"s introduction to typesetting with					
	LATEX, Silmaril Consultants, Textual Therapy Division, 2003.					
	2. George Gratzer, More Math Into LATEX, 4th Edition, Springer					
	Science (2007).					
	3. Frank Mittelbach, MichelGoossens, TheLaTex Companion,					
	Second Edition, Addison-Wesley, 2004.					
Website and	1. https://www.latex-tutorial.com/tutorials/					
e-Learning Source	2. https://www.latex-tutorial.com/					
	3. <u>http://www.tug.org.in/tutorials.html</u>					

Students will be able to

- CLO1 Understand the basic LaTeX document and the e-contents.
- CLO2 Construct the structures of contents, index, glossary and text.
- CLO3 Create the type setting equations
- CLO4 Discuss several types of boxes and floats.
- CLO5 Prepare the basic documentation.

	POs							PSOs	
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1

Signature of the Subject Experts