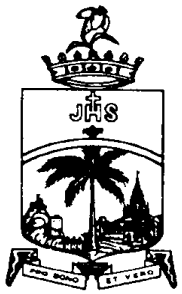
MASTER OF PHILOSOPHY IN MATHEMATICS

SYLLABUS - 2007-09



ST. JOSEPH'S COLLEGE (AUTONOMOUS)

(Nationally Reaccredited with A+ Grade / College with Potential for Excellence)

TIRUCHIRAPPALLI - 620 002

TAMIL NADU, INDIA

ST. JOSEPH'S COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI - 620 002
DEGREE OF MASTER OF PHILOSOPHY (M. PHIL.)
FULL TIME - AUTONOMOUS REGULATIONS

GUIDELINES

1. ELIGIBILITY

✧ A Candidate who has qualified for the Master's Degree in any Faculty of this University or of any other University recognized by the University as equivalent there to (including old Regulations of any University) subject to such conditions as may be prescribed therefore shall be eligible to register for the Degree of Master of Philosophy (M.Phil.) and undergo the prescribed course of study in a Department concerned.

✧ A candidate who has qualified for Master's degree (through regular study / Distance Education mode / Open University System) with not less than 55% of marks in the concerned subject in any faculty of this university or any other university recognized by Bharathidasan University, shall be eligible to register for M.Phil. SC / ST candidates are exempted by 5% from the prescribed minimum marks.

2. DURATION

The duration of the M.Phil. course shall be of one year consisting of two semesters for the full-time programme.

3. COURSE OF STUDY

The course of study shall consist of

Part - I : 3 Written Papers
Part - II : 1 Written Paper and Dissertation.

The three papers under Part I shall be :

Paper I : Research Methodology
Paper II : Advanced / General Paper in the Subject
Paper III : Advanced Paper in the subject

Paper I to III shall be common to all candidates in a course. Paper I, II, III & IV shall consist of 5 units each covering the subject requirements of the course offered. The Board of Studies shall approve the Syllabi for Papers. The syllabus for paper IV shall be prescribed by each Research Advisor, which is also to be approved by the Board of Studies. The number of specialized papers by the research advisor can be more than one.

Question papers for Papers I to III shall be set externally and valued by two examiners, one internal and one external. The concerned HOD will be in the Board of Examiners to pass the results. Paper IV shall be set and valued by the Research Adviser. The Controller of Examinations shall conduct the examinations for all papers and dissertation.

4. SCHEME OF EXAMINATION

4.1 Part-I (First Semester)

Paper I : Research Methodology
Paper II : Advanced / General paper in the subject
Paper III : Advanced paper in the subject

Part-II (Second Semester)

Paper IV : Field of specialization
Paper V : Dissertation

4.2 Written Examination

The examinations for Papers-I, II and III shall be taken at the end of the first semester and Paper-IV at the end of the second semester. Each paper shall have 100 marks for the semester examination (written) and 100 marks for Continuous Internal Assessment.

The CIA components are:

Seminar-I	:	15 marks
Mid semester	:	35 marks
Seminar-II	:	15 marks
End semester	:	35 marks
Total	:	100 marks

Both the CIA marks and the external marks should be mentioned separately in the mark sheets. The duration for each semester examination shall be 3 hours. A candidate shall be declared to have passed Part-I & II examinations if he/she secures not less than 50 of the marks each in the CIA and the semester examination respectively. The aggregate of the marks secured in the semester examinations and CIA marks taken together must be 50% in each of the Papers I to IV and Dissertation.

4.3 Credits for Papers I to IV

Paper	Name	Contact Hours	Library Hours	Total Hours	Credits	CIA Marks
I	Research Methodology	6	6	12	10	100
II	Core Subject	6	6	12	10	100
III	Core Subject	6	6	12	10	100
IV	Optional Subject	2	4	6	5	100
	Total			42	35	400

Credits for Dissertation

Internal Examination (the split up for CIA)

Project	Credits	Marks	Total Marks
Seminar on review of related literature	3	30	200
Seminar on Data Analysis / Results	2	20	
Dissertation Evaluation	15	150	
Viva - voce	5	100	100
Total	**25**	**300**	**300**

External Examination

	Credits	Marks
Dissertation Evaluation	20	200
Viva-voce	5	100
Total	**25**	**300**

4.4 Dissertation

For carrying out the dissertation the mandatory requirement is strictly adhering to the rules of the college as given below:

4.4.1a Requirement

Every student is expected to give two seminars one concerning Review of Related Literature within the four weeks from the beginning of the second semester and the other on Data Analysis / Result just before the submission of the final draft of the dissertation

4.4.1b Submission

Candidates shall submit the Dissertations to the Controller of Examination not earlier than five months but within six months in the full time programme. The above said time limit shall start from 1st of the month which follows after the month in which Part-I examinations are conducted. If a candidate is not able to submit his/her Dissertation within the period stated above, he/she shall be given an extension time of three months in the first instance and another three months in the second instance with penalty fees. If a candidate does not submit his Dissertation even after the two extensions, his registration shall be treated as cancelled and he has to re-register for the course subject to the discretion of the Principal. However the candidate need not write once again the theory papers if he / she has already passed these papers.

4.4.1c Requirement

For the valuation of dissertation the mandatory requirement is a pass in papers I to IV. One external examiner and the Research Adviser shall value the Dissertation. The external examiner should be selected only from outside the college and shall be within the colleges affiliated to Bharathidasan University. In case of non-availability, the panel can include examiners from the other university / colleges in Tamil Nadu. The external examiner shall be selected from a panel of 3 experts suggested by the Research Adviser. However, the Controller of Examination may ask for another panel if he deems it necessary. Both the internal and external examiner will evaluate the Dissertation and allot the marks separately. However the viva-voce will be done by both of them. The average marks will be considered.

4.4.2 Viva-voce

The external examiner who valued the Dissertation and the Research Adviser shall conduct the Viva-Voce for the candidate for a maximum of 100 marks. A Candidate shall be declared to have passed in viva-voce if he secures not less than 50% of the marks prescribed for Dissertation and 50% of the marks in the aggregate of the marks secured in viva-voce test and Dissertation valuation. A student can undertake project in the second semester whether or not he /she has passed the first semester.

5. QUESTION PAPER PATTERN

5.1 Internal (Mid & End)

5.1a For Science

There are two sections A and B:

Section A contains 8 short answer Questions	8 × 4	= 32
Section B contains 4 Essay Question	4 × 17	= 68
		100

5.1b For Arts

Only one section of Essay type questions 5 × 20 = 100

5.2 External Exam (Semester)

5.2a For Science

Section A - 10 short answer Questions	10 × 3	= 30
Section B - 5 Essay type Questions either or	5 ×14	= 70
		100

5.2b For Arts

Only one section of Essay type questions 5 out of 8 (5 × 20 = 100)

5.2c For the Paper-IV (Optional/Research Adviser's paper)

The Question paper pattern for Paper IV is common for both Science and Arts. The pattern is only one section with Essay type Questions 5 out of 8 (5 × 20 = 100)

There may be two separate mark sheets for the first and second semester respectively. The marks allotted by the guide and that by the External Examiner must be shown in separate columns of the 2nd Semester mark sheet.

6. CLASSIFICATION OF SUCCESSFUL CANDIDATES

6.1 The candidates who pass the Part - I and Part - II examinations in their first attempt shall be classified as follows:

No.	Total Marks secured in Part - I and Part - II Examinations	Classification
1.	80% and above in the case of Science Subjects & 75% and above in the case of Arts and Social Science Subjects	I Class with Distinction
2.	60% to 79% in the case of Science Subjects & 60% to 74% in the case of Arts and Social Science Subjects	I Class
3.	50% to 59% in all the subjects (Mathematics, Statistics and Computer Science / Applications shall be treated as Science Subjects)	II Class

6.2 Candidates who pass the course in more than one attempt shall be declared to have completed the programme under II Class.

7. QUALIFICATIONS OF RESEARCH ADVISER FOR THE M.Phil. COURSE

7.1 A person eligible to be a Research Adviser shall be required to possess a Ph.D. Degree or two years of Post-Graduate teaching experience after qualifying for M.Phil. / M.Litt. degree. He / She should have obtained recognition from the University.

7.2 In view of the paucity of guides in the newly emerging subjects like Biotechnology, Microbiology, Remote Sensing the research guides in the related areas may be permitted to guide students provided these guides satisfy the qualification requirements.

7.3 Normally a person shall be allowed to guide not more than three candidates.

7.4 Change of guide may be permitted by the Principal based on the merit of the individual cases.

8. ATTENDANCE

- ✧ Daily attendance for 90 working days should be enforced for the students.
- ✧ Periodical report of a student to the guide concerned should be recorded in the register kept by the guide.

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M.PHIL. MATHEMATICS - COURSE PATTERN - 2007

Sem	Code	Course	Title of the paper
I	07 MMA 101	I	Research Methodolgy, Graph Theory and Topology
	07 MMA 102	II	Algebra & Analysis
	07 MMA 103	III	Wavelets, Fuzzy Automata and Chaotic Systems
II	07 MMA 204	IV	Fundamentals of Domination In Graphs
	07 MMA 205	IV	Product Graphs
	07 MMA 206	IV	Labeling of Graphs
	07 MMA 207	IV	Homological Algebra and Semigroups
	07 MMA 208	IV	Stochastic Models in Queueing Theory
	07 MMA 209	IV	Harmonic Analysis
	07 MMA 210	IV	Advanced Fluid Dynamics
	07 MMA 211	IV	Non-Linear Differential Equations
	07 MMA 212	IV	Advanced Fuzzy Automata
	07 MMA 213	IV	Cryptography
	07 MMA 214	IV	Topology of Metic Spaces and Fixed Point Theory

Sem I
07MMA101

Paper I: RESEARCH METHODOLGY, GRAPH THEORY AND TOPOLOGY

Unit I: Research Methodology

An Introduction - Defining the Research Problem- Research Design.]
(Text Book 1: Chapter I, II & III pp 1-67)

Unit II: Factorization
Factorizations and Decompositions.
(Text Book 2: Chapter 9, Section 9.2)

Unit III: Domination of Graphs
Domination number of Graph-The Independent Domination number of a Graph-Other Domination parameters.
(Text Book 2: Chapter 10, Sections 10.1, 10.2, 10.3)

Unit IV: **Metric Spaces**
Complete Metric Spaces-Compactness in Metric Spaces-Pointwise Compact Convergence.
(Text Book 3: Chapter 7 Sections 43, 45 & 46)

Unit V: Homotopy
Homotopy of Paths -The Fundamental Group-Covering Spaces.
(Text Book 3: Chapter 9 Sections 51, 52 & 53)

Text Books:

1. Research Methodology by C.R. Kothari, Wishwa Prakashan 1990.
   For Units I, II -Graphs and Digraphs, Fourth Edition - G.Chartrand and
2. Lesniak, Chapman & Hall/CRC. 3 edition (August 1, 1996)
3. Topology by James R.Munkres-Prentice Hall of India. (Second Edition),2002.

Reference Books:

1. General Topology by James Dugundji, Allyn and Bacon , Boston ,1996.

Sem - I
07MMA102

Paper - II ALGEBRA & ANALYSIS

Unit I: Modules
Modules homomorphism and exact sequence, projective and injective.
Modules homomorphism and duality.
(Chapter 4.1, 4.3, 4.4, Text Book - 1)

Unit II: Commutative Rings and Modules
Chain conditions-Prime and primary ideals - Primary decomposition. Noetherian rings and modules.
(Chapter 8.1, 8.2, 8.3, 8.4, Text Book - 1)

Unit III: Banach algebras

Banach algebras-spectrum of an element in Banach algebra-spectral radius formula-Quotient algebras-applications.
(Book 2-Chapter 18 pages 386-402, Text Book - 2)

Unit IV: Bounded Operators
Basic Facts-Bounded Operators-A Commutativity Theorem-Resolution of the Identity.
(Chapter 12 Sections 12.1 to 12.21, Text Book - 3)

Unit V:Spectrum
The Spectral Theorem-Eigen values of Normal Operators-Positive Operators and Square Roots-The group of Invertible Operators.
(Chapter 12 Sections 12.22 to 12.38, Text Book - 3)

Text Books

1. Algebra by Thomas. W.Hungerford, Springer Indian reprint 2004.
2. Real and Complex analysis by Walter Rudin,Tata McGraw Hill (II Edition),1996.
3. Functional Analysis by Walter Rudin-Tata McGraw-Hill Publishing Co. Ltd., 1974 Edition, 1980.

Reference Book

1. Functional Analysis by Limaye, New Age International , 1996.

Sem - I
07MMA103

Paper III: WAVELETS, FUZZY AUTOMATA AND CHAOTIC SYSTEMS

Unit I: The Discrete Fourier Transform
Properties of Discrete Fourier Transform - Translation - Translation-invariant- The Fast Fourier Transform. (Chapter II , Section 2.1,2.2,2.3).

Unit II: Wavelets on Z_N
Construction of wavelets on Z_N: First Stage - Construction of wavelets on Z_N: The Iteration step - Examples and Applications. (Chapter III, Section 3.1,3.2,3.3)

Unit III: Fuzzy Automata
Fuzzy subsets-finite state machines-finite state automata-languages and grammar-nondeterministic finite state automata-relations between languages and automata - Fuzzy languages-types of fuzzy grammars.
Sections 1.4,1.6-1.10,4.1,4.2.

Unit IV: Fuzzy Grammar
Fuzzy context- free grammars- fuzzy context-free Max-product grammars - Fuzzy finite state machines-Homomorphisms- Submachines of a fuzzy finite state machine-fuzzy recognizers and its languages.
Sections 4.3,4.4, 6.1 - 6.3,6.7, Pages 337,338 of section 7.2.

Unit V: Chaotic Systems
Three simple Chaotic systems Mechanical, Chemical oscillators, The Lorenz equation - Mappings Logistic, Henon maps- Fixed and periodic points of maps - Tents and Horse shoes. (Chapter XV, Section 15.1, 15.2 - 15.2.2)

Book For Study

1. For units I and II :An Introduction to Wavelets through Linear Algebra - Michael W. Frazier, Springer ,1999.
2. For units III and IV: Fuzzy Automata and Languages Theory and Applications, John. N. Mordeson and Davender.S.Malik, CRC Press Company, 2002.
3. For unit V :Differential Equations - A.C.King, J.Billingham, S.R.Oho Cambridge University Press (2003) (Linear, Non-Linear, Ordinary, Partial).

Sem - II
07MMA204

Paper-IV: FUNDAMENTALS OF DOMINATION IN GRAPHS

Unit-I: Bounds in terms of degree

Bounds in terms of order and size - Bounds in terms of degree, diameter, and girth.

Unit-II: Bounds in terms of covering

Bounds in terms of independence and covering - Product graphs and Vizing's conjecture - Grid graphs.

Unit-III: Varieties of domination

Varieties of domination - Multiple dominations - Parity restrictions.

Unit -IV: Location of dominating sets

Locating domination - Distance domination.

Unit-V: Global domination

Strong and weak domination - Global and factor domination.

Text Book

1. Teresa W Haynes, Stephen T Hedetniemi, Peter J Slater, Marceal Dekker, *Fundamental of Domination in Graphs*, 1998., Marcel Dekker inc., 270 - Madison Avenue, Newyork.
   Sections: 2.3 to 2.6, 7.1 to 7.6.

Reference Books

1. Walikar H.B., Acharya B.D. and Sampathkumar E. - *Recent developments in the theory of domination in graphs: - MRI lecture notes in Maths,* volume 1, 1979, Mahta Research Institute, Allahabad,.
2. Teresa W. Haynes, Stephen T. Hedetniemi, and Peter. J. Slater. *Domination in graphs Advanced Topics* . 1998, Marcel Dekker Inc. 270, Madison Avenue, New York.

Sem - II
07MMA205

Paper-IV: PRODUCT GRAPHS

Unit-I: Basic Concepts
Graphs - Automorphisms and invariants - Hyper cubes and isometric sub graphs.

Unit-II: The Cartesian Product
Prime factor decomposition - Automorphisms.

Unit-III: Strong products
Strong products and retracts - Direct products in Γ and $\Gamma_{o.}$

Unit-IV: Algebraic Structures
Basic algebraic properties of Lexicographic products.

Unit-V
Automorphism in Lexicographic products.

Text Book

1. Wilfred Imrich and Sandi Klavzar. Product graphs Structure and recognition**,** John Wiley & Sons, Inc. New York, 2000
   Sections 1.1 to 1.4, 4.1, 4.2, 5.1, 5.3, 6.1 and 6.3

Sem - II
07MMA206

Paper-IV: LABELING OF GRAPHS

Unit-I: History of Labellings

Statement of the problem - A context for the problem - A history of sub problems.

Unit-II: Characterization

Necessary conditions for graceful graphs - Classes of graceful graphs - some general Questions.

Unit-III: Labelling of complete graphs

Euclidean models and complete graphs - Numbered graphs and difference sets.

Unit-IV: Path Number

Results on path number - The unrestricted path number.

Unit-V: Special type of labelling

Felicitous labellings of graphs.

TEXT BOOK

1. Ronalc Read, Graph theory and Computing, Academic press, 1972
   For units I to IV: Chapter 2 and 3 (page 23 to 44) (Except 2.9 and 3.4)
2. Arumugam, S., Acharya, B.D. and S.Sampathkumar, S., Graph theory and its applications.
   For Unit V: Chapter 3 Pages 47 to 61.

Sem - II
07MMA207

Paper-IV: HOMOLOGICAL ALGEBRA AND SEMIGROUPS

Unit-I: Modles
Modules, Free modules, Exact sequences, Semi exact sequences, Tensor Products.

Unit-II: Modules of Homomorphisms
Modules of Homomorphisms projective Modules Injective modules - Categories and Functors - Notion of Category and functors and examples
(Treatment as in " Introduction to Homological Algebra by S. T.Hu.)
Chapter I and Chapter II Pages 24 - 100

Unit-III: Semigroup
Semigroup, Basic definitions, Semigroup of relations on a set of Congruences. Factor groupoids and homomorphisms - Units and Maximal subgroups.

Unit-IV: Bands and semilattices
Bands and semilattices, regular semi groups, Inverse semi groups. Embedding semigroups in groups Free semi groups and generating relations.

Unit-V: Green's relations
Green's relations - D-structre of the full transformation semi group Tx on a set x. Regular D-classes. Simple semigroups. Principal factors of a semigroup (Treatment as in "The Algebraic theory of Semigroups" Vol I by A.H.Clifford and G.B. Preston Chapter I and II pages 1 -75)

Reference:
1. Northcotl, D.G., An introduction to Homological Algebra. Cambridge University Press, 1960.

Sem - II
07MMA208

Paper-IV: STOCHASTIC MODELS IN QUEUEING THEORY

Unit-I: M/M Models

Steady state solution for M/M/1 model - Measures of effectiveness - Waiting Time distributions - Little's formula - Finite system capacity - Queues with truncation (M/M/1/K) - Transient behaviour - Busy period analysis. (Sec 3.1 to 3.4).

Unit-II: Birth-Death Processes

Birth-Death Processes - Queues with parallel channels (M/M/C) - Queues with parallel channels and Truncation (M/M/C/K) - Erlang's formula (M/M/C/C). (Sec 3.1 to 3.4).

Unit-III: Queues with unlimited service

Queues with Unlimited Service (M/M/∞) - Steady state results - Transient analysis - Finite source Queues - State dependent Service - Queues with impatience - M/M/1 Balking - M/M1 Reneging. (Sec 3.5 to 3.8).

Unit-IV: Bulk Input

Bulk Input (M^x/M/1) - Bulk Service (M/M^y/1) Erlangian Models (M/E_k/1 and E_k/M/1) (Sec 4.1 to 4.3.2).

Unit-V: General Service

Single Server Queues with Poisson Input and General Service (M/G/1) - Measures of effectiveness - Steady system size Probabilities - Special Cases (M/E_k/1 and M/D/1) (Sec 5.1.1 to 5.1.5).

Text Book

1. Donald Gross and Carl M. Harris, Fundamentals of Queueing Theory, John Wiley & Sons, New York, 1974.

Sem - II
07MMA209

Paper-IV: HARMONIC ANALYSIS

Unit-1: Fourier Series & Integrals

Definition and easy results - The Fourier transform - Convolution, approximate identities, Fejer's theorem - Unicity theorem, Parseval relation; Fourier Stieltjes Coe - The Classical Rernals. (Chaper 1)

Unit-2: Fourier series and Integrals (continued)

Summability: Metric Theorems - Pointwise summability - Positive definite sequences: Herglotz theorem - The inequality of Hausdorff and Young - Measures with bounded powers; endomorphisms (Chapter1)

Unit-3: The Fourier Integral

Introduction - Kernels of R - The Plancherel theorem - Another convergence theorem; the Poisson summation formula - Bochner's theorem - The continuity theorem. (Chaper 2)

Unit-4: Discrete and Compact groups

Characters of discrete groups - Characters of compact group - Bochner's theorem (Chapter 3; Sec 3.1, 3.2, 3.3)

Unit-5

Examples - Minkowski's theorem - Measure on infinite product spaces - continuity of seminorms. (Chapter 3; Sec 3.4, 3.5, 3.6, 3.7)

Text Book

1. Henry Helson, Harmonic Analysis, Addison-Wesley Pub (Sd), May 1983.

Sem - II
07MMA210

Paper-IV: ADVANCED FLUID DYNAMICS

Unit 1: Motion of a Sphere

Motion of a Sphere through an infinite massAof a liquid at rest at infinity - Liquid streaming past a fixed sphere -Equations of motion of a Sphere - Sphere projected in a liquid under gravity- Pressure distribution on a Sphere
[Chapter 8, Articles 8.1 to 8.7 pp 350 to 371]

Unit 2: Concentric Spheres

Concentric Spheres - Problem of Initial motion - Three dimensional sources, sinks and doublets - Complex Potential due to a 3D doublet -Image of a 3D source w.r.to a plane- Image of a 3D doublet w.r.to a plane- Image of a 3D source w.r.to a Sphere- image of a doublet in front of a Sphere
[Chapter 8, Articles 8.9 to 8.17, pp 371 to 396]

Unit 3: Wave Motion

General expression of a wave motion -Mathematical representation of wave motion - standing or Stationary waves -Types of liquid waves-Surface waves- Energy of Progress waves - Energy of Stationary waves- Progressive waves reduced to a case of Steady motion -Waves at the interface of two liquids.
[Chapter 10, Articles 10.1 to 10.10, pp 508 to 524]

Unit 4: Newtonian

Newton's law of viscosity- Newtonian and Non-Newtonian fluids- Body and Surface forces- Stress vector - State of stress at a point-Plane Stress ,Principal stresses and Principal directions.
[Chapter 11, Articles 11.1 to 11.10, pp 553 to 572]

Unit 5: Nature of strain

Nature of strain- Transformation of the rates of strain components Relation between stress and rates of strain-Stoke's law of viscosity.

[Chapter 11, Articles 11.12 tol1.14, p.582 to 594]

Text Book

1. Raisinghania, M.D., Fluid Dynamics, S.Chand & Co. (2003)

Reference Book

1. Frank Charlton, Text Book of Fluid Dynamics, CBS Publishers and Distributors (2000)

Sem - II
07MMA211

Paper-IV: NON-LINEAR DIFFERENTIAL EQUATIONS

Unit I: Integral Manifolds

Groanwall's inequality - phase space - critical points - periodic solutions - First integrals and integral manifolds - Liouville's theorem.

Unit II: Linear System

Two, three dimensional linear systems - critical points of nonlinear equations - The Poincare-Bendixson theorem and its applications - periodic solutions in R_n.

Unit III: Stability Theory

Stability - stability of equilibrium solutions - stability of periodic solutions - linearisation - asymptotic stability - instability.

Unit IV: Centre Manifolds

Bifurcation - averaging and normalisation - centre manifolds - bifurcation of equilibrium solutions - Hopf bifurcation.

Unit V: Chaos

Chaos - The Lorenz equations - one dimensional chaos: the quadratic map, the tent map - Fractal sets and its dynamical characterisations Lyapunov exponents.

Text book

1. Ferdinand Verhulst, Nonlinear Differential Equations and Dynamical Systems Second Edition, Springer, 1996.

   Chapters: 1 - 5, 7, 13 and 14.

Sem - II
07MMA212

Paper-IV: ADVANCED FUZZY AUTOMATA

Unit-1: FINITE AUTOMATA

Finite State System - Basic Definitions - Non-Deterministic Finite Automata- Finite Automata with $\in$-moves - Regular Expressions. Chapter- 2 (Section: 2.1 to 2.5)

Unit-II: PROPERTIES OF REGULAR SETS

The Pumping Lemma for regular sets- Closure Properties of regular sets.

Chapter-3 (Section: 3.1, 3.2) Chapter- 4 (Section: 4.1, 4.2)

Unit-III: CONTEXT FREE GRAMMARS

Motivation and Introduction-Context-Free Grammars - Derivation Trees- Implication of Context-Free Grammars - The Pumping Lemma for Context-Free Languages - Closure Properties of Context-Free Languages.

Chapter- 4 (Section: 4.3, 4.4) Chapter- 6 (Section: 6.1, 6.2)

Unit-IV: FUZZY SET THEORY

Definitions - Basic Operations on Fuzzy Sets - The Extension Principle Membership functions and Fuzzification. Chapter- 2 (Section: 2.2 to 2.5)

Unit-V: FUZZY GRAMMAR AND FUZZY AUTOMATA

Fuzzy Languages - Fuzzy Grammars - Fractionally Fuzzy Grammars - Fuzzy Automata. Chapter- 8 (Section: 8.2 to 8.4, 8.10)

Books for Study

1. John E.Hopcroft (J.E.H) and Jeffrey D.Ullman (J.D.U), Introduction to Automata Theory, Languages and Computation, (Narosa Publishing House)

   For Unit I, II & III:

2. Sankar K.Pal and Dwijesh K.Dutta Majumder.Fuzzy Mathematical Approach to Pattern Recognition.

   For Unit IV & V

Unit-I	Chapter-2 (Section: 2.1 to 2.5)
Unit -II	Chapter-3 (Section: 3.1, 3.2)
	Chapter-4 (Section: 4.1, 4.2)
Unit-III	Chapter-5 (Section: 4.3, 4.4)
	Chapter-6 (Section: 6.1, 6.2)
Unit-IV	Chapter-2 (Section: 2.2 to 2.5)
Unit-V	Chapter-8 (Section: 8.2 to 8.4, 8.10)

Sem - II
07MMA213

Paper-IV: CRYPTOGRAPHY

Unit I: Symmetric key encryption

Symmetric key encryption - Stream ciphers - Block Ciphers - DES - Modes of operation.

Unit II: Public-key cryptography

Modular arithmetic - Discrete key log function - RSA system.

Unit III: Operations in RSA

Digital signature - Hash functions - Merkle's method - Probabilistic signatures

Unit IV: Discrete logarithm

Elgamal's encryption - Digital signature algorithm - Robin's encryption

Unit V: Protocols

Kerberos - Diffie-Hellman key agreement - Fiat-Shamir identification scheme - Zero knowledge

Text Books

1. Hans Delfs and Hellmut Knebl, Introduction to Cryptography, Springer 2003
   Chapter 2 : 2.1, 2.2
   Chapter 3 : full
   Chapter 4 : 4.1, 4.2.1 to 4.2.3

Reference

1. Koblitz, A course in Number Theory and Cryptography, Springer-Verlag, 1994, Springer Verlag.

Sem - II
07MMA214

Paper-IV: TOPOLOGY OF METIC SPACES AND FIXED POINT THEORY

Unit I : Metric Contraction Principles

Banach's contraction Principles - Extensions of Banach's Principle - the caristi-Ekeland Principle - Equivalent of the caristi -Ekeland Principle - Set valued contractions - Generalised contractions.
(Chapter 3: Sec : 3.1-3.6)

Unit II : Hyper convex spaces

Hyper convexity - Properties of Hyper convex spaces - a fixed point theorem -intersection of hyper convex spaces - approximate fixed points - Isbell's hyper convex hull.
(Chapter 4: Sec : 4.2-4.7)

Unit III : Normal structures in Metric spaces

A fixed point theorem - structure of the fixed point set - uniform normal structure - uniform relative normal structure - Quasi normal structure - Stability and normal structure - ultra metric spaces - fixed point set structure - separable case.
(Chapter 5: Sec : 5.1-5.8)

Unit IV: Metric Fixed Point Theory

Contraction mapping - Basic theorems for nonexpansive mapping - A closer look at I1 - The Goebel-Karlovitz Lemma - Orthogonal Convexity
(Chapter 8: Sec : 8.1-8.6)

Unit V: Fixed Point Theory in Banach Lattices:

Structure of the fixed point set - Asymptotically regular mapping - set valued mappings - Fixed point theory in Banach lattices.
(Chapter 8: Sec : 8.7-8.10)

Text Book

1. An introduction to Metric spaces and fixed point theory - Mohamed A.Khasi and William A. Kirk, A wiley - Inter Science Publication John Wiley and Sons, Inc. 1 edition (March 6, 2001)

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