

SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN, ODDANCHATRAM

(Recognized Under Section 2(f) and 12(B) of UGC Act 1956)

(Affiliated to Mother Teresa Women's University, Kodaikanal)

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

CURRICULUM FRAMEWORK AND SYLLABUS FOR

OUTCOME BASED EDUCATION IN

SYLLABUS FOR

M.Phil., MATHEMATICS

FRAMED BY

MOTHER TERESA WOMEN'S UNIVERSITY, KODAIKANAL

UNDER

CHOICE BASED CREDIT SYSTEM

2015 - 2018

LIST OF SPECIAL PAPER

- 2E1. Domination in Graphs
- 2E2. Fuzzy Graphs and Fuzzy Hyper graphs
- 2E3. Fuzzy Sets, Logic and Theory of Neural Networks
- 2E4. Topology and imager processing

Any other paper as per the choice of any faculty member of the Department of Mathematics shall be added in this list. The syllabus will be framed by the Department and shall be implemented after getting orders from the Vice-Chancellor.

One from the list of Special paper may be selected by the students depending on the area of their research.

1. ELIGIBILITY AND ADMISSION:

Pass in M.Sc Mathematics with 55% of marks. SC/ST students will be given 5% concession as per the government norms. The students will be admitted to the course through an Entrance Examination. The selection will be based on 50% to marks for M.Sc Mathematics course and 50 % to marks obtained in the entrance examination. Only Degree obtained after 10+2+3+2 years for M.Sc will be consider.

2. EXAMINATION:

The course will be offered through Choice Based Credit System. All the examination rules applicable to the CBCS of the University shall apply to this course also. Each paper will be evaluated on the basis of internal assessment and end semester examination. There shall be 50% marks to the internal assessment and remaining 50% shall be for the end semester examination. Question paper for the end semester examination shall be set internally by the concerned course teacher. The scripts of the end semester examination shall be evaluated by one internal examiner (course teacher or any other faculty member appointed by the Chairman) and one external examiner appointed by the Vice-Chancellor from the list of examiners given by the Chairman of the Board/Head of the Department.

The classification of the candidates in the examination shall be on the basis of the system followed for the CBCS in the University Departments.

The Dissertation shall be evaluated by the external examiner for 100 marks The viva-voce examination shall carry a maximum of 100 marks awarded by the two internal examiners namely the supervisor of the dissertation and one more internal examiner appointed by the Head of Department ..

3. QUESTION PAPER PATTERN:

Question paper pattern for each paper shall be as follows:

Answer All questions(5 x 12=60) Max.Marks 60

Q. No 1 or 2 from Unit I

Q. No 3 or 4 from Unit II

Q. No 5 or 6 from Unit III

Q. No 7 or 8 from Unit IV

Q. No 9 or 10 from Unit V

Necessary number of sub-divisions may be created in each question as per the content of the questions.

Paper I

Subject code: 1C1

Research Methodology

Hours: 6

Unit I: Research Report

Structure of Report-Contents Steps in Drafting- Layout of Research Reporting- Styles of Reporting- Types of Report-Guidelines to Review Report-Typing Instructions-Oral presentation-Types of Research Process – Data Collection – Secondary data – Thesis Writing: Thesis at Tertiary level Writing

Unit II: Bounded linear Operators

Uniformly Continuous semi groups of bounded linear operators-Strongly continuous semi groups of bounded linear operators-The Hille-Yosida theorem-the Lumer Phillips theorem.

Unit III: Infinitesimal Generators and Semigroups

The characterization of the infinitesimal generators of CoSemi groups-Groups of bounded operators-The inversion of laplace transform-Two exponential formulas.

Unit IV: Fundamental Group

Homotopy of paths- Fundamental Group- Covering Spaces-Fundamental Group of the Circle and S^n .

Unit V: Separation Theorems in the Plane

Jordan Separation Theorem-Invariance of Domain-Jordan curve Theorem

Text Book:

1. "Research Methodology" R.PanneerSelvam, Prentice Hall of India, NewDelhi, 2005. Unit I
2. "Semigroups of Linear Operators and Applications to partial Differential Equations" A.Pazy, Springer-Verlag, New York 1983
Unit II : Chapter 1 Section 1.1-1.4
Unit III : Chapter 1 Section 1.5-1.8
3. "Topology" J.R.Munkers secondedition, PHI learning Private Limited New Delhi 2011.
Uni IV : Chapter 9 Section 51-54 and 59
Unit V : Chapter 10 Section 61-63.

Reference Book:

1. "Research Methodology-Methods and Techniques" C.R.Kothari, New Age International publications.
2. "Semigroups of Linear Operators and Applications", J.A.Golstein, Oxford Universitypress, New York, 1985
3. "Algebraic Topology" W.S. Massey, Springer-Verlag, New York, 1976.

Paper II

Subject code: 1C2 Mathematical Methods Hours: 6

Unit I: Fourier Transforms

Fourier Transforms – Defn. Inversion Theorem – Fourier cosine transforms - Fourier sine transforms – Fourier transforms of derivatives - Fourier transforms of some simple functions - Fourier transforms of rational functions – The convolution integral – convolution theorem – Parseval's relation for Fourier Transforms – solution of PDE by Fourier transform. Laplace's Equation in Half plane - Laplace's Equation in an infinite strip - The Linear diffusion equation on a semi-infinite line.

Unit II: Hankel Transforms:

Definition – Elementary properties of Hankel Transforms - Hankel Transforms of Derivatives of functions - Hankel Transforms of some elementary functions - The Parseval relation for Hankel transforms – Relation between Fourier and Hankel transforms – Application to PDE. Axisymmetric Dirichlet problem for a half – space. Axisymmetric Dirichlet problem for a thick plate

Unit III: LATEX

Text formatting, TEX and its offspring, what's different in LATEX 2e, Distinguishing LATEX 2e, Basics of LATEX file. Commands and Environments – Command names and arguments, Environments, Declarations, Lengths, Special Characters, Fragile Commands, Exercises. Document Layout and Organization – Document class, Page style, Parts of the document, Table of contents, Fine – Tuning text, Word division.

Unit IV: Mat lab

Introduction - Basics of MATLAB, Input – Output, File types – Platform dependence – General commands Interactive Computation: Matrices and Vectors – Matrix and Array operations – Creating and Using *Inline* functions – Using Built-in Functions and On-line Help – Saving and loading data – Plotting simple graphs.

Unit V: Programming in MATLAB

Scripts and Functions – Script files – Functions files - Language specific features – Advanced Data objects. Applications – Linear Algebra – Curve fitting and Interpolation – Data analysis and Statistics – Numerical Integration – Ordinary differential equations – Nonlinear Algebraic Equations.

Text Book:

1. "The Use of Integral Transforms", I.N.Sneddon, Tata McGrawHill, New Delhi, 1974, Unit I and II
2. "Guide to LATEX", H. Kopka and P.W. Daly, Third Edition, Addison – Wesley, London, 1999.
Unit III: Chapter 1: Sections: 1.1-1.3, 1.4.1, 1.5.,
Chapter 2: Sections: 2.1-2.7
Chapter 3: Sections: 3.1-3.6
3. "Getting Started with MATLAB – A Quick Introduction for Scientists and Engineers", Rudrapratap, Oxford University Press, 2003.
Unit IV and Unit V

Reference Book:

1. "Introduction to Matlab 7 for Engineers", William John Palm McGraw-Hill Professional, 2005.
2. "Introduction to MATLAB 7", Dolores M. Etter, David C. Kuncicky, Prentice Hall, 2004.

Paper III

Subject Code 1C3 **Professional Skills** **Hours** 6

Objective:

After completing the course the scholars will be able to:

- Develop skills of ICT and apply them in teaching learning context and Research.
- Acquire the knowledge of communication skills with special reference to its elements, types, development and styles.
- Understand the terms communications Technology and Computer mediated teaching and develop multimedia /E-content in their respective subject.
- Acquire the knowledge of Instructional Technology and its applications.
- Develop different teaching skills for putting the content across to targeted audience.

Unit I: Computer Applications Skills

Computer system, Characteristics, Parts and their functions – Operation of computer: Switching on/ off/ restart, Mouse control, Use of key board and some functions of key- Information and Communication Technology (ICT): Definition and Features of ICT- Integration of ICT in teaching and learning-ICT application: Using word processors, Spread sheets, MS Word: Cut, Copy and Paste, Paragraph Alignment, Spell Check Organizational Chart, Equation Editor, Mail Merge., MS Excel: Work sheet Statistical Functions-Mathematical-Charts & Graphs-MS Power Point slides Preparation Background design Transition Effects Page Header Footer Images Audio Effects-ICT for Research: On-line journals, research articles from databases like Emerald Insight Sage, Elsevier, Science Direct, etc e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations.

UNIT II: Communication Skills (Option: English or Tamil)

Communication: Definitions – Elements of Communication and Noise- Types of Communication: Spoken and Written; Non-verbal Communication-Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics – mentoring tutoring skills for slow learners – Nuances of Written communication in preparing lecture notes – Commutative Skills – Rhetoric and developing good language abilities – public speaking – writing skills.

UNIT III: Communication Technology

Communication Technology: Bases, Trends and development skills of using communication technology - computer mediated teaching : Multimedia, E- content – Satellite – based communication ; EDUSAT and ETV Channels , Communication

through web; Audio and video applications on the Internet, Interpersonal communication through the web.

UNIT IV: Instructional Technology

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and instruction – Lecture and Technique : Steps , Planning of a lecture , Lecture notes updating delivery of a lecture – Narration in tune with the nature of different disciplines’ – lecture with power point presentation -Versatility of lecture technique – Demonstration – Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques – Team Teaching, Group Discussion, Seminar, Workshop, Symposium and panel discussion – Modes of teaching: CAI , CMI and WBI – Games and simulations.

UNIT V: Pedagogical Skills

Teaching skills : Definition, Meaning and nature – Types of Teaching Skills : Skill of Set Induction, Skill of stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of closure – Integration of Teaching Skills – Evaluation of Teaching Skills Research, Extension and Consultancy – Preparation – Project Proposals funding agencies.

References:

1. "Integrating Technology into Teaching and Learning Concept Applications", D.Michael and William Prentice Hall, New York(2000),
2. "Information and Communication Technology in Education: A Curriculum for Schools and Programs for Teacher Development", Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
3. " Teaching Communication", S.K .Pandey,Commonwealth Publishers, New Delhi(2005).
4. "Fundamentals of Education Technology", R.A.Sharma,Surya Publications, Meerut (2006).
5. " Microteaching (vol. 1&2)",A.KumBabu and S.Dandabani,Neelkammal Publications, Hyderabad (2006),
6. " Computer Education",M.Vanaja and S.Rajasekar, Neelkammal Publications, Hyderabad(2006).
7. " Curriculum Reforms and Teaching Methods", Bela Rani Sharma, Sarup and Sons, New Delhi (2007).

Paper IV

Subject Code 2E1 Domination in Graphs Hours : 6

Unit I Bounds on the Domination Number

Introduction – Bounds in terms of order- bounds in terms of order, degree and packing- bounds in terms of order and size- bounds in terms of degree, diameter and grith- bounds in terms of independence and covering –Product Graphs and Vizing's conjuncture- Grid Graphs(Chapter2,2.1 to 2.6)

Unit II Dominations, Independence, Irredundance

Hereditary and super Hereditary properties – Independent sets - Dominating sets - Irredundand sets – The domination chain – Extension chain – Extensions using maximality and minimality. (chapter3: 3.1 to 3.6)

Unit III Efficiency, Conditions on the Dominating Set

Introduction – codes and cups – closed Neighborhoods – Computational Results - Realizability (Chapter 4: 4.1 to 4.5)

Unit IV Varieties of Domination

Multiple Domination – Parity Restrictions – Locating-Domination – Distance Domination – Strong and weak Domination – Global and Factor Domination – Domination in Directed Graphs.(Chapter 7: 7.1 to 7.7)

Unit V Sum and Product of Parameters

Nordhaus – Gaddum Type results – Gallai Type Theorems – Other sums and Products (Chapter 9:9.1 to 9.3)

References

- 1) Teresa W. Haynes, Stephen T. H. Hedetniemi and Peter J Slater, "Fundamentals of domination in graphs", Marcel Dekker, New York, (1998) (Chapters 1, 2, 3, 4 and 6)
- 2) Michael A.Henning, Anders Yeo, Total domination in Graphs, Springer Monographs in Mathematics(2013)
- 3) T.Hedetniemi, R.C.Lasker " Topics on domination", Northoland, (1991)

Paper IV

Subject Code 2E2 Fuzzy Graphs and Fuzzy Hyper graphs Hours : 6

Unit I Fuzzy Subsets

Fuzzy Relations – Fuzzy Equivalence Relations – Pattern classification – Similarity Relations. (Chapter 1: 1.1 to 1.4)

Unit II Fuzzy Graphs

Paths and Connectedness – Bridges and Cut vertices – Forests and Trees – Trees and Cycles – Characterization of Fuzzy Trees – Fuzzy cut sets – Fuzzy chords, Fuzzy cotrees and Fuzzy twigs – Fuzzy one chain with boundary 0, cobound and cocycles – Fuzzy cycle sets and Fuzzy co cycle set – Fuzzy line Graphs. (Chapter 2: 2.1 to 2.2)

Unit III Fuzzy Interval and Operation on Fuzzy Graphs

Fuzzy intersection Graphs - Fuzzy interval Graphs – The Fulkerson and Gross characterization – The Gilmore and Hoffman Characterization – Operations on Fuzzy Graphs – Cartesian products and Composition – Union and Join – on Fuzzy Tree Definitions (Chapter 2: 2.3 to 2.5)

Unit IV Fuzzy Hypergraph

Fuzzy Hypergraph – Fuzzy Transversals of Fuzzy Graphs – Properties of $Tr(H)$ – Construction H . (Chapter 4: 4.1 to 4.2)

Unit V Coloring and Intersection of Fuzzy Hypergraph

Coloring of Fuzzy Hypergraphs – Beta degree coloring Procedures – Chromatic values of Fuzzy Coloring – Intersecting Fuzzy Hypergraphs – Characterization of Strongly intersection Hypergraph – Simply ordered intersecting Hypergraph – H dominant Transversals. (Chapter 4: 4.3 to 4.4)

Text Book:

1. "Fuzzy graphs and Fuzzy hypergraphs", John N. Mordeson, Premchand S. Nair, Physica-Verlag, A Springer- Verlag Company, 2000

Reference Books:

1. Klir, G.J., U. St. Clair, U.H., and Yuan, B. 'Fuzzy Set Theory, Foundations and Applications', Prentice Hall, Upper Saddle River, N.J, 1997

2. Rosenfeld, L., Zadeh, K.S., Fu, M., Shimura, 'Fuzzy Sets and Their Applications', Academic Press, 1975

3. Berge, C., 'Hypergraphs', North Holland, Amsterdam, 1989

Paper IV

Subject Code 2E3 Fuzzy Sets, Logic and Theory of Neural Networks Hours : 6

Unit I: Fuzzy sets and Fuzzy relations

Fuzzy sets – Basic types and basic concepts – Properties of α -cuts – Representations of fuzzy sets – Decomposition Theorems – Extension principle for fuzzy sets . Crisp and fuzzy relations – Projections and cylindric extensions – Binary fuzzy relations – Binary relations on a single set – Fuzzy equivalence relations – Fuzzy compatibility relations – Fuzzy ordering relations – Fuzzy Morphisms – Sup-I compositions of fuzzy relations. Inf-w compositions of fuzzy relations.

Unit II: Fuzzy Relation Equations

Introduction- Problem Partitioning-Solution Method-Fuzzy Relation Equations Based on Sup-i Compositions-Fuzzy Relation Equations Based on Inf-w Compositions- Approximate Solutions- The Use of Neural Networks.

Unit III: Fuzzy Logic

Introduction – Fuzzy Propositions – Fuzzy Quantifiers – Linguistic Hedges – Inference from Conditional Fuzzy Propositions – Inference from Conditional and Qualified Propositions – Inference from Quantified Propositions.

Unit IV: Fuzzy Control

Origin and Objective-Automatic Control-The Fuzzy Controllers., Types of Fuzzy Controllers-The Mamdani Controller- Defuzzification-The Sugeno Controller., Design Parameters-Scaling Factors-Fuzzy Sets-Rules-Adaptive Fuzzy Control- Applications.

Unit V: Neural Network Theory

Neuronal Dynamics : Activations and Signals –Neurons As Functions-Signal Monotonicity-Biological Activations and Signals-Competitive Neuronal Signals-Neuron Fields-Neuronal Dynamical Systems-Common Signal Functions-Pulse-Coded Signal Functions. Activations Models- Neuronal Dynamical Systems-Additive Neuronal Dynamics-Additive Neuronal Feedback-Additive Activation Models- Additive Bivalent Models.-Bivalent Additive BAM-Bidirectional Stability-Lyapunov Functions- Bivalent BAM Theorem.

Text Book

1. "Fuzzy sets and fuzzy logic: Theory and applications", G. J. Klir and Yaun Bo Prentice Hall of India, New Delhi, (2002). (Relevant Sections only) Units I, II & III
2. "Fuzzy Set Theory and its Applications", H.J. Zimmermann, Fourth Edition, Kluwer Academic Publishers, London, (2001). (Relevant Sections only) Unit IV
3. Bart Kosko, "Neural Networks and Fuzzy Systems", Prentice Hall of India, New Delhi, (2001). (Relevant Sections only) Unit V

Reference Book:

1. "Introduction to the theory of fuzzy sets", Kaufmann ,Volume 1 -, Academic Press, Inc., Orlando, Florida,(1973).
2. "Fuzzy Mathematics: An introduction forEngineers and Scientists", John N. Moderson andPremchand S. Nair – PhysicaVerlag, Heidelberg, Germany, (1998).
3. "Neural Networks, Fuzzy Logic andGenetic Algorithms Synthesis and Applications" S.Rajasekaran and G.A. VijayalakshmiPai., Prentice-Hall of India, New Delhi,(2004).

Paper IV

Subject Code 2E4 Topology and Imager Processing Hours : 6

Unit I : Topological Space and Continuous Functions

Topological spaces-Basis for Topology-the order of topology-The product Topology on $X \times Y$ -The Subspace Topology-Closed Sets and Limit Points-Continuous Functions-The Product Topology-The Metric Topology-The Quotient Topology.

Unit II : Connectedness and Compactness

Connected Spaces-Connected Sub Spaces of the Real Line-Compactness and Local Connectedness-Compact Spaces-Compact Subspaces of the Real Line-Limit Point compactness-Local Compactness.

Unit III: Countability and Separation Axioms

The Count ability Axioms- The Separation Axioms-Normal Spaces-The Urysohn Lemma-The Urysohn Metrization Theorem-The Tychonoff Theorem-The Complete Metric Space-Compactness in Metric Space.

Unit IV : Digital Image Fundamentals: Introduction-An Image Model-Sampling and Quantization-Basic Relationships between Pixels - Image Geometry -Properties of 2D Fourier Transform.

Unit V :Image Compression: Fundamentals-Image Compression Models-Error Free Compression-Lossy Compression-Image Compression Standards, Image Segmentation: Detection of Discontinuities-Edge Linking and Boundary Detection-Thresholding-Region Oriented Segmentation-Use of Motion Segmentation.

Text Book :

1. "Topology" James R. Munkres, Second Edition, PHI Learning Private Limited , new Delhi, 2011.

Unit I- Chapter 2 Section 12-21

Unit II- Chapter 3 Section 23-29

Unit III Chapter 4 Section 30-34 and Chapter 5 Section 37 Chapter 7 Section 43 and 45

2. "Fundamentals of Digital Image Processing", A.K.Jain Prentil Hall of India 1989 Unit IV and Unit V

Reference Book:

1. "Algebraic Topology-An Introduction" W.S Massey, Spriger Verlay Newyork 1976.
2. "Digital Image Processing" C.Gonzalez and R.E.Woods, Addison Wesley