SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III -CC- X: Functional Analysis

Ins. Hrs./Week: 6 **Course Credit**: 5 **Course Code**:

OBJECTIVES

- To introduce fundamental topics in spectral theory
- To discuss the basic results of spectral theory
- To study the structure theorems of functional analysis viz, the Hahn Banach theorem, the open mapping theorem and the closed mapping theorem

UNIT- I: Banach Spaces **(20 Hours)**

Banach Spaces - Normed Linear spaces- Definitions and properties – Examples of Banach Spaces – Quotient Spaces – Direct Sum of Subspaces – Continuous Linear Transformations- Continuous Linear Functionals - Introduction – The Hahn-Banach Theorem – Some consequences of the Hahn-Banach Theorem – The Uniqueness of Extension – The Natural embedding of N in N^{**}.

UNIT –II: Bounded Linear Operators **(18 Hours)**

The Basic Theorems Of Bounded Linear Operators- Introduction – The Open Mapping Theorem – The Closed Graph Theorem – The Banach - Steinhaus Theorem - Hilbert Spaces- Introduction – Definitions and Examples – Hilbert Space and its basic properties - Orthogonal Complements – The Orthogonal Decomposition Theorem – Orthonormal Sets – Complete Orthonormal Sets.

UNIT –III: Operators on Hilbert Spaces **(16 Hours)**

Operators On Hilbert Spaces- Introduction – The Adjoint Operator – Self-adjoint Operators – Normal Operators – Unitary Operators – Projection Operators.

UNIT- IV: Spectral Theory **(17 Hours)**

Spectral Theory- Introduction – Linear Operators and Matrices on a finite dimensional Hilbert Space – Spectrum of an operator on a finite dimensional Hilbert Space H –The Finite Dimensional Spectral Theorem – Compact Operators.

UNIT –V: Banach Algebras **(19 Hours)**

Banach Algebras -Introduction – Definitions and Examples – Regular and Singular Elements – Topological Divisors of Zero – The Spectrum – Important Consequences of the Non-emptiness of the Spectrum – Spectral Mapping Theorem for polynomials and Spectral Radius Formula – Ideals in a Banach Algebra – Gelfand Theory of Banach Algebras.

Total Lecture Hours- 90

COURSE OUTCOME

The students will be able to

1. Recognize the fundamental properties of normed spaces and the transformations between them.
2. Understand the central concepts from functional analysis, including the Hahn Banach Theorem, the Open Mapping Theorem and the Closed Graph Theorem.
3. Understand the main properties of bounded operators of Hilbert spaces.
4. Understand the notion of Hilbert Spaces and apply the spectral theorem to the resolution of integral equations.
5. Understand the basic properties of Banach Algebra

TEXT BOOKS

1. Somasundaram.D. 2006. A First Course in Functional Analysis, Narosa Publishing House Pvt. Ltd., New Delhi.

UNIT - I	Chapter 1	:	Sec. 1.5 to 1.9
	Chapter 2	:	Sec. 2.1, 2.2, 2.4 to 2.6, 2.8
UNIT –II	Chapter 3	:	Sec. 3.1, 3.2, 3.4, 3.5
	Chapter 4	:	Sec. 4.1 to 4.3, 4.5 to 4.8
UNIT- III	Chapter 5	:	Sec. 5.1 to 5.6
UNIT - IV	Chapter 6	:	Sec. 6.1 to 6.5
UNIT- V	Chapter 7	:	Sec. 7.1 to 7.9

REFERENCE BOOK(S)

1. Laurent Schwarz. 1964. Functional Analysis, Courant Institute of Mathematical Sciences, University, New York.
2. Limaye.B.V.1985. Functional Analysis, Wiley Eastern Limited, second print, Bombay.
3. Simmons.G.F.1963. Introduction to Topology and Modern Analysis, MC Graw-Hill Publishing Company Limited, New Delhi.
4. Walter Rudin. 1974. Functional Analysis, TMH Edition. MC Graw Hill, New York.
5. Yosida.K. 1974. Functional Analysis, Springer- Verlag, London.

E-RESOURCES

1. http://www.math.nsc.ru/LBRT/g2/english/ssk/fa_e.pdf
2. https://www.maths.usyd.edu.au/u/athomas/FunctionalAnalysis/daners-functional-analysis-2017.pdf
3. https://people.math.ethz.ch/~salamon/PREPRINTS/funcana.pdf
4. https://www.maths.lancs.ac.uk/~belton/www/notes/fa_notes.pdf
5. https://59clc.files.wordpress.com/2012/08/functional-analysis-_-rudin-2th.pdf

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III- CC-XI : Differential Geometry

Ins. Hrs./Week: 5 **Course Credit**: 5 **Course Code**:

OBJECTIVES

- To introduce the notion of surfaces and its properties
- To enable students to learn first fundamental form of the surfaces
- To study the geodesic and non-intrinsic equations of a surface

UNIT-I: Theory of space curve **(14 Hours)**

Introduction to space curves-Representation of space curves-Unique parametric representation of a space curves-Definitions and some basic examples-Arc length-Tangent and osculating plane - Principle normal and binormal -Curvature and torsion -Curvature and Torsion of a curve as the intersection of two surfaces-Contact between curves and surfaces.

UNIT-II: Tangent Surfaces **(15 Hours)**

Introduction to Tangent surfaces- Involutes and evolutes-Definitions and theorems- Intrinsic equation of space curves - Definition & Examples-Fundamental existence theorem for space curves –Theorem & examples -Helices-Theorem on characterises of cylindrical helices - Spherical helix.

UNIT-III : First fundamental form of a surface **(17 Hours)**

Introduction to Metric on a surface - First fundamental form –Definitions & examples - Direction coefficients of a surface- Theorems and examples -Families of curves - Orthogonal trajectories - Double family of curves -Isometric correspondence.

UNIT-IV: Geodesic on a surface **(15 Hours)**

Introduction to Geodesic-Geodesic and their differential equations-Theorems and examples-Canonical Geodesic equations-Geodesics on surface of revolution-Geodesic curvature-Definitions and theorems - Gauss- Bonnet theorem-Gaussian Curvature - Surfaces of constant curvature.

UNIT-V: Second fundamental form of a surface **(14 Hours)**

Introduction to Second fundamental form-Definitions and theorems-Classification of points on a surface - Principle curvatures-Lines of curvatures - Developable surfaces-Edge of regression -Developable associated with space curves- Developable associated with curves on surface-Minimal surfaces.

Total Lecture Hours- 75

COURSE OUTCOME

The students will be able to

1. Acquire knowledge about basic properties of arc length, principle normal.
2. Gain the knowledge of intrinsic equation of space curves and helices.
3. Enhance the concept of first fundamental form and orthogonal trajectories.
4. Develop knowledge of geodesics and surfaces of constant curvature.
5. Assimilate the concept of developable surfaces and minimal surfaces.

TEXT BOOK(S)

1. Somasundaram D. 2008. Differential Geometry A First Course. Narosa Publishing house, New Delhi.

UNIT- I	Chapter 1	:	Sec.1.1 to 1.7, 1.9, 1.10
UNIT- II	Chapter 1	:	Sec.1.13, 1.16 to 1.18
UNIT -III	Chapter 2	:	Sec.2.9 to 2.14
UNIT -IV	Chapter 3	:	Sec.3.2, 3.10, 3.12, 3.13
UNIT- V	Chapter 4	:	Sec. 4.2, 4.4, 4.5, 4.7 to 4.10

REFERENCE BOOK(S)

1. Jain.S.K.2002. Differential geometry, Ivy publishing house, New Delhi.
2. Pressley. A. 2005. Elementary Differential Geometry, Springer International Edition. Verlog, London.
3. Thorpe. J. A. 1979. Elementary topics in Differential Geometry, Springer Publishers, New York.
4. Weatherbun. C. E. 2016. Differential Geometry of three dimensions, Cambridge University Press, India.
5. Willmore. T. J. 2002. Introduction to Differential Geometry, Oxford University Press, New Delhi.

E- RESOURCES

1. https://www.scribd.com/document/398285043/Differential-Geometry-A-First-Course-pdf
2. http://www.freebookcentre.net/Mathematics/Differential-Geometry-Books.html
3. https://www.mat.univie.ac.at/~michor/dgbook.pdf
4. https://people.math.ethz.ch/~salamon/PREPRINTS/diffgeo.pdf
5. http://etananyag.ttk.elte.hu/FiLeS/downloads/_01_Csikos_Differential_geometry.pdf

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc.,MATHEMATICS

Semester: III- CC-XII : Partial Differential Equations

Ins. Hrs./Week: 5 **Course Credit**: 5 **Course Code**:

OBJECTIVES

- To give in-depth knowledge of solving partial differential equations and apply the scientific and engineering problems
- To introduce the students how to solve Linear partial differential with different models
- To equip students with the concept of PDE and learn as to how to solve Linear & Non-linear Partial differential equations

UNIT- I : Partial Differential Equations of the first order **(15 Hours)**

Partial Differential Equations- Origins of first order Partial differential equations- Cauchy's problem for first order equations- Linear equations of the first order - Integral surfaces Passing through a given curve - Surfaces Orthogonal to a given system of surfaces.

UNIT-II: Partial Differential Equations of the first order **(15 Hours)**

Cauchy's Method of Characteristics- Compatible systems of first order equations- Charpit's Method- Special types of first order equations- Some Example problems - Solutions Satisfying Given Conditions- Jacobi's Method.

UNIT –III: Partial Differential Equations of the Second order **(16 Hours)**

The Origin of Second Order Equations -Linear Partial Differential Equations with Constant co-efficient - Some Theorems- Example problems - Equations with variable coefficients- Characteristic curves of second order equations.

UNIT- IV: Partial Differential Equations of the Second order **(14 Hours)**

Characteristics of equations in three variables- The solution of Linear Hyperbolic equations - Separation of variables - The method of Integral Transforms – Non-Linear equations of the second order.

UNIT –V: Laplace's Equation **(15 Hours)**

Elementary solutions of Laplace's equations- Examples Problems-Families of equipotential Surfaces- Boundary Value Problems-Separation of Variables -Kelvin's Inversion-The Theory of Green's Function of Laplace's equation.

Total Lecture Hours – 75

COURSE OUTCOME

The students will be able to,

1. Solve Linear partial differential equations of both first and second order.
2. Extract information from partial derivative models in order to interpret reality.
3. Formulate appropriate numerical methods for solving various problems in PDE.
4. Classify the fundamental Principles of PDE to solve hyperbolic, parabolic and elliptic equations.
5. Practice ethical and professionalism in technical report writing and presentation.

TEXT BOOK(S)

1. Ian N. Sneddon. 2006. Elements of Partial Differential Equations**,** Dover Publication – INC, NewYork..

UNIT - I Chapter 2 : Sec. 1 to 7
UNIT - II Chapter 2 : Sec. 8 to 13
UNIT - III Chapter 3 : Sec. 1,4 to 6
UNIT - IV Chapter 3 : Sec. 7 to 11
UNIT - V Chapter 4 : Sec. 2 to 5, 7 ,8

REFERENCE BOOK(S)

1. Bhargava and Chandramouli. 2015. Differential Equations, Prakashan Edition III. New Delhi.
2. Copson.E.T.1973. Partial Differential Equations, Cambridge University Press, London.
3. Raisinghania.M.D.1988.Advanced Differential Equations, S. Chand and Company Ltd, New Delhi.
4. Walter A. Strauss. 2007. Partial Differential Equations An Introduction, Brown University, Rhode Island.
5. Zachmanoglou E.C. and Dale W. Thoe. 1986. Introduction to Partial Differential Equations and its Applications, Dover Publications, New York.

E-RESOURCES

1. http://www.math.toronto.edu/ivrii/PDE-text Book/
2. https://math.stackexchange.com
3. http://www.nrce.niepa.ac.in
4. http://www.mathworks.com
5. http://ocw.mit.edu

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc.,MATHEMATICS

Semester: III- CC-XIII : Advanced Numerical Analysis

Ins. Hrs./Week: 5 **Course Credit**: 4 **Course Code**:

OBJECTIVES

- To make students familiarize with the ways of solving complicated Mathematical problems numerically
- To understand the several errors and approximations in Numerical methods
- To explain the several available methods to solve simultaneous equations

UNIT- I: Transcendental and Polynomial Equation **(15 Hours)**

Introduction – Bisection Method – Iteration Method Based on First & Second Degree Equation - Rate of Convergence – Secant Method- Regula Falsi Method- Newton Raphson Method- Muller Method and Chebyshev Method- Polynomial Equations- Descarte's Rule of Signs – Iterative Methods- Birge-Vieta Method- Bairstow's Method.-Direct Method-Graeffe's Root Squaring Method.

UNIT-II: System of Linear Algebraic Equations **(15 Hours)**

Error Analysis of Direct Methods – Operational count of Gauss Elimination- Vector norm-Matrix norm- Error Estimate – Iterative Improvement of the Solution. Iteration Methods – Jacobi Iteration Method-Gauss Seidel Iteration Method-Successive Over Relaxation Method – Convergence Analysis of Iterative Methods- Optimal Relaxation Parameter for the SOR Method – Iterative Method to determine Inverse of the Matrix.

UNIT –III: Eigen Value problems **(15 Hours)**

Eigen values and Eigen vectors – Definitions - Bounds on Eigen Values – Gerschgorin Theorem and Brauer Therorem – Definitions - Jacobi Method for Symmetric matrices - Power Method only.

UNIT- IV: Interpolation and Approximation **(15 Hours)**

Hermite Interpolations- Piecewise and Spline Interpolation – Piecewise Linear Interpolation-Piecewise Quadratic Interpolation-Piecewise Cubic Interpolation- Piecewise Cubic Interpolation using Hermite Type Data- Spline interpolation – Quadratic Spline interpolation-Cubic Spline interpolation- Bivariate Interpolation – Lagrange's Bivariate interpolation.

UNIT–V: Differentiation and Integration **(15 Hours)**

Introduction - Numerical Differentiation – Methods Based on Interpolation, Methods Based on Finite Difference Operators- Methods Based on Undetermined Coefficients - Optimum choice of Step length – Extrapolation methods – Partial Differentiation. Numerical Integration- Methods based on undetermined coefficients – Gauss Legendre Integration method and Lobatto Integration Methods only.

Total Lecture hours-75

COURSE OUTCOME

The students will be able to

1. Solving a system of equations.
2. Apply rigorous, analytic, highly numerate approach to analyze and solve problems using Numerical Methods.
3. Know as how to find the roots of transcendental equations.
4. Learn as how to interpolate the given set of values.
5. Learn numerical solution of differential equations.

TEXT BOOK(S)

1. Jain.M.K, Iyengar.S.R.K, Jain.R.K. 2012. Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited Publishers, New Delhi.

UNIT– I	Chapter 2	: Sec. 2.1 to 2.5, 2.9
UNIT– II	Chapter 3	: Sec. 3.3, 3.4
UNIT – III	Chapter 3	: Sec. 3.5, 3.6, 3.7, 3.11
UNIT – IV	Chapter 4	: Sec. 4.5, 4.6, 4.7
UNIT– V	Chapter 5	: Sec. 5.2 to 5.5 & 5.8 (Pages 361-365 and 380-386)

REFERENCE BOOK(S)

1. Hamming R.W. 1973. Numerical Methods for Scientists and Engineers, Dover Publications, Inc., New York.
2. James F. Epperson. 2013. An Introduction to Numerical Methods and Analysis, Wiley Publication, New Delhi.
3. Patil P. B and Verma. U.P. 2013. Numerical Computational Methods, Narosa Publishing House Pvt. Ltd., New Delhi.
4. Sankara Rao. K. 2009.Numerical Methods for Scientists and Engineers, PHI Learning Private Limited, New Delhi.
5. Sastry S.S. 2012. Introductory Methods of Numerical Analysis, PHI Learning Private Limited, New Delhi.

F-RESOURCES

1. http://www.ikiu.ac.ir/public-files/profiles/items/090ad_1410599906.pdf
2. https://fac.ksu.edu.sa/sites/default/files/numerical_analysis_9th.pdf
3. http://www.math.iitb.ac.in/~baskar/book.pdf
4. http://www.ikiu.ac.ir/public-files/profiles/items/090ad_1410599906.pdf
5. https://www.maths.dur.ac.uk/~bmjg46/na17.pdf

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III -CP- I: Optimization Techniques with Microsoft Excel and Solver

Ins. Hrs. / Week : 2 **Course Credit: 2** **Course Code :**

OBJECTIVES

- To Enable the students to learn Excel solver / open solver and as to how to use them in operation research.
- To Model and Solve linear programming, transportation and assignment problem easily by this excel solver / open solver.
- To Model and Solve Inventory and queuing problems quickly using excel solver / open solver.

LIST OF PRACTICALS

1. To Formulate and Solve Linear Programming Problems using solver.
2. To Formulate and Solve Integer Programming Problems using solver.
3. To Formulate and Solve Transportation Problems using solver.
4. To Formulate and Solve Assignment Problems using solver.
5. To Formulate and Solve Simulation Problems using solver.
6. To Formulate and Solve Inventory Problems using solve.
7. To Formulate and Solve Queuing problems using solver.

COURSE OUTCOME

The students will be able to

1. Learn features of Excel solver as a Modeling tool.
2. Familiarise with all the features of solver and easily handle solver.
3. Develop programming skills and technique to solve mathematical problems.
4. Use this feature effectively in various problems in operation research.
5. Use Microsoft Excel solver as a simulation tool.

REFERENCE BOOK(S)

1. David R. Anderson and Dennis J.Seeny et al. 2012. An Introduction to Management Science, 13th Edition. South-Western Cengage Learning, USA.
2. Frederick S. Hillier and Mark S. Hillier. 2012. An Introduction to Management Science. 5th Edition. McGraw-Hill/Irwin Publishers, New York.
3. Hamdy A. Taha. 2017. Operations Research: An Introduction. 10th Edition. Pearson Prentice Hall Publishers. New Jersey.
4. Kanti Swaroop et al. 2019. Operations Research-Introduction to Management Science, 7th Edition. Sultan Chand & Sons, New Delhi.
5. Wayne L.Winston and Christian Albright S. 2009. Practical Management Science. 3rd Edition. South-Western Cengage Learning, USA.

E-RESOURCES

1. https://easyengineering.net/power-plant-engineering-by-a-k-raja/https://ebooks.lpude.in/commerce/bcom/term_5/DCOM303_DMGT504_OPERATION_RESEARCH.pdf
2. https://thalis.math.upatras.gr/~tsantas/DownLoadFiles/Taha%20-%20Operation%20Research%208Ed.pdf
3. https://www.excel-easy.com/data-analysis/solver.html
4. https://www.solver.com/solver-tutorial-using-solver

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc.,MATHEMATICS

Semester: III- EC-III(1) : Advanced Probability Theory

Ins. Hrs./Week: 4 **Course Credit**: 4 **Course Code**:

OBJECTIVES

- To introduce the basic terminology of probability theory
- To study some mathematical tools and axiomatic approach to probability theory
- To study the theorems of probability and probability distributions

UNIT- I : Theory of Probability **(12 Hours)**

Introduction - Short history - Basic terminology - Mathematical probability - Definition - Limitations of classical definition - Statistical probability - Definition -Limitations of empirical probability - Solved examples and review problems - Subjective probability.

UNIT-II : Mathematical Tools **(12 Hours)**

Sets and Elements of sets - Operations on sets - Algebra of sets - Limit of sequence of sets - Classes of sets-Axiomatic approach to probability - Random experiment-Sample space and Elementary events - Definition - Event definition - Some illustrations to explain the concept of the sample space and event - Acceptable assignment of probabilities - Natural assignment of probabilities.

UNIT –III : Theorems on Probability **(13 Hours)**

Some theorems on probability - Addition theorem - Extension of Addition theorem of probability to n events - Boole's inequality - Conditional probability - Multiplication theorem of probability - Independent events - Multiplication theorem of probability for independent events - Solved examples and review problems.

UNIT- IV : Probability Distributions **(12 Hours)**

Introduction - Bernoulli distribution - Moments of Bernoulli distribution.

Binomial distribution : Moments of Binomial distribution - Recurrence relation for the Moments - Factorial Moments - Mean deviation about mean - Mode - Moment generating function - Additive property - Characteristic function – Cumulants - Recurrence relation for Cumulants - Probability generating function - Recurrence relation for the probabilities of Binomial distribution.

UNIT –V: Exact sampling Distributions **(11 Hours)**

Introduction – Derivation of the Chi-square distribution – M.G.F of Chi - square distribution - cumulant generating function of Chi-square distribution - Limiting form of Chi-square distribution for large degrees of freedom – Characteristic function of Chi-square distribution - Mode and Skewness of Chi-square distribution - Additive property - Chi-square probability curve – Linear transformation - Applications of Chi-square distribution.

Total Lecture Hours - 60

COURSE OUTCOME

The students will be able to

1. Understand the foundations of probability theory.
2. Apply probability-based mathematical tools in solving problems.
3. Prove important theorems in probability theory.
4. Apply probability distributions in different situations.
5. Solve advanced problems in probability theory independently.

TEXT BOOK(S)

1. Gupta S.C, and Kapoor V.K., 2002. Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Educational Publishers, New Delhi.

UNIT I	Chapter 3 : Sec. 3.1 to 3.6.
UNIT II	Chapter 3 : Sec.3.7 to 3.8.4
UNIT III	Chapter 3 : Sec.3.9 to 3.13.
UNIT IV	Chapter 8 : Sec.8.1, 8.3 to 8.4.12.
UNIT V	Chapter 15 : Sec.15.1 to 15.3, 15.5, 15.6.

REFERENCE BOOK(S)

1. Bhat R. 2014. Modern Probability Theory (3rd Edition). New Age International (P) Ltd. New Delhi.
2. Jim Pitman. 1996. Probability. Narosa Publishing House. New Delhi – 110017.
3. Murray R. Spiege, John Schiller and Alu Srinivasan R. 2012. Probability and statistics. Fourth Edition. MC Graw Hill Education Pvt. Ltd, India.
4. Pillai R.S.N and Bagavathi V. 2016. Statistics Theory and Practice. Eight Edition. S.Chand & Company Ltd. New Delhi.
5. Rohatgi V.K. 1988. An Introduction to Probability Theory and Mathematical Statistics. Wiley Eastern Ltd. New Delhi.

E-RESOURCES

1. https://www.math.uh.edu/
2. http://people.math.harvard.edu/~ctm/papers/home/text/class/harvard/154/course/course.pdf.
3. http://wiki.stat.ucla.edu/socr/index.php/Probability_and_statistics_EBook.
4. https://www.bcebhagalpur.ac.in/wp-content/uploads/2020/04/Probability-and Statistics.pdf.
5. http://bio5495.wustl.edu/Probability/Readings/DeGroot4thEdition.pdf

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III-EC-III (2): Fuzzy Mathematics

Ins. Hrs./Week: 4 **Course Credit**: 4 **Course Code**:

OBJECTIVES

- To introduce the concept of fuzzy theory and study its application in real problems.
- To study the uncertainty environment through the fuzzy sets that incorporates imprecision and subjectivity into the model formulation and solution process.
- To study Fuzzy decision making

UNIT –I: From Classical Sets to Fuzzy Sets **(13 Hours)**

Introduction of Fuzzy Sets – Fuzzy sets- Basic types – Fuzzy power sets - Fuzzy sets: Basic Concepts - Related Theorem – Cutworthy property – Strong Cutworthy property – Fuzzy Sets Versus Crisp Sets- Additional Properties of α-cuts – Related Theorems – Extension Principle for Fuzzy sets – Related Theorems.

UNIT – II: Operations on Fuzzy Sets **(12 Hours)**

Types of Operations – Fuzzy Complements – First Characterization Theorem of Fuzzy Complements – Second Characterization Theorem of Fuzzy Complements – Fuzzy Intersections- t- Norms – Characterization Theorem of t-Norms - Fuzzy Unions- t-Conorms - Characterization Theorem of t-Conorms – Combinations of Operations – Theorems on Combinations of Operations.

UNIT – III: Fuzzy Arithmetic **(11 Hours)**

Fuzzy Numbers – Theorems on Fuzzy Numbers - Linguistic variables – Arithmetic operations on intervals – Properties of Arithmetic operations – Arithmetic operations on Fuzzy numbers – Related Theorems on Arithmetic operations on Fuzzy numbers - Lattice of Fuzzy numbers – Related Theorems on Lattice of Fuzzy numbers.

UNIT – IV: Fuzzy Relations **(12 Hours)**

Binary Fuzzy Relations – Binary Relations on a Single Set – Reflexive - Irreflexive – Antireflexive – symmetric – Antisymmetric – Strictly Antisymmetric – Transitive – Nontransitive – Antitransitive - Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Ordering Relations – Fuzzy Morphisms.

UNIT – V: Fuzzy Decision Making **(12 Hours)**

Individual Decision Making – Multiperson Decision Making – Fuzzy Ranking Methods –Fuzzy Linear Programming – Cost vector – Constraint matrix – Right-hand side vector – Related problems in all these.

Total Lecture Hours- 60

COURSE OUTCOME

The students will be able to

1. Learn the Fuzzy sets and properties of α- cuts.
2. Learn the Fuzzy Sets Operations.
3. Understand the concept of Fuzzy Arithmetic.
4. Learn the Binary Fuzzy Relations & Fuzzy compatibility Relations.
5. Learn the Ranking methods & Fuzzy Linear Programming.

TEXT BOOKS

1. George J.Klir and Bo Yuan. 2006. Fuzzy Sets and Fuzzy Logic Theory and Applications, Prentice Hall learning Private limited, India.

UNIT - I	Chapter 1	: Sec. 1.1,1.3, 1.4 &
	Chapter 2	: Sec. 2.1 and 2.3
UNIT -II	Chapter 3	: Sec. 3.1 to 3.4
UNIT -III	Chapter 4	: Sec. 4.1 to 4.5
UNIT -IV	Chapter 5	: Sec. 5.3 to 5.8
UNIT -V	Chapter 15	: Sec. 15.2, 15.3, 15.6, 15.7

REFERENCE BOOK(S)

1. Ganesh. M. 2006.Introduction to Fuzzy Sets and Fuzzy Logic, Prentice Hall of India.
2. George J. Klir. and Bo Yuan. 1996. Fuzzy Sets, Fuzzy Logic and Fuzzy Systems, World Scientific Publishing, Co. Pvt. Ltd., Singapore.
3. Lotfi A Zadeh and Rafik A Aliev. 2019. Fuzzy Logic Theory and Applications (Part I and Part II), World Scientific Publishing, Co. Pte. Ltd., Singapore.
4. Timothy J. Ross. 2010. Fuzzy Logic with Engineering Applications, Third Edition.Wiley India Pvt. Ltd, New Delhi.
5. Zimmermann H.J. 1991. Fuzzy Set Theory and its Applications, Allied Publishers Limited, India

E-RESOURCES

1. https://cours.etsmtl.ca/sys843/REFS/Books/ZimmermannFuzzySetTheory2001.pdf
2. file:///C:/Users/ELCOT/Desktop/FUZZY%20MATHEMATICS.pdf
3. https://www.iitk.ac.in/eeold/archive/courses/2013/intel-info/d1pdf3.pdf
4. https://www.mv.helsinki.fi/home/niskanen/zimmermann_review.pdf
5. https://www.myreaders.info/06-Fuzzy_Set_Theory.pdf

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

Semester: III- EDC-II(1) : Mathematical Statistics

Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**:

OBJECTIVES

- To understand the principles, concepts, tools and techniques in statistics
- To expose the students to inculcate the power of accurate analysis
- To find the solution to some of the problems in Statistics

UNIT- I: Measure of central tendency (9 Hours)

Introduction to Measures of Central Tendency (Averages) – Requisites for an ideal measure of Central Tendency – Arithmetic Mean – Properties of Arithmetic Mean – Merits and Demerits of Arithmetic Mean - Weighted Mean - Median – Median for Continuous Frequency Distribution - Merits and Demerits of Median - Mode – Mode for Continuous Frequency Distribution - Merits and Demerits of Mode - Geometric Mean - Geometric Mean of the Combined Group - Merits and Demerits of Geometric Mean – Solved Problems.

UNIT-II: Measures of dispersion (9 Hours)

Introduction to Measures of dispersion – Range - Quartile deviation - Mean deviation about an average - Standard Deviation and Root Mean Square Deviation – Different formula for calculating Variance – Variance of the Combined Series – Solved Problems.

UNIT–III:Correlation (9 Hours)

Introduction to Correlation – Meaning of Correlation - Scatter Diagram - Karl Pearson's coefficient of Correlation – Limits for Correlation Coefficient – Assumptions underlying Karl Pearson's Correlation Coefficient – Solved Simple Problems Only.

UNIT- IV: Regression (9 Hours)

Introduction to Regression – Linear Regression - Regression Coefficients – Properties of Regression Coefficients – Angle between two lines of Regression – Standard error of Estimate or Residual Variance – Correlation Coefficient between Observed and Estimated Values - Curvilinear Regression – Regression Curves – Solved Simple Problems Only.

UNIT –V: Probability (9 Hours)

Introduction to Probability – Basic Terminology – Probability – Limitations - Mathematical Tools- Preliminary Notions of Sets – Sets and elements of Sets – Operations on Sets – Algebra of Sets – Limit of Sequence of Sets – Classes of Sets - Axiomatic approach to Probability – Random Experiment-Sample Space and Elementary Events – Event – Natural Assignment of Probabilities – Axiomatic Probability – Algebra of Events – Some Theorems on Probability – Addition Theorem of Probability - Solved Simple Problems Only.

Total Lecture Hours – 45

COURSE OUTCOME

The students will be able to

1. Learn the basic properties and determination of Mean, Median and Mode.
2. Understand the concepts and learn the determination of Measures of Dispersion.
3. Acquire knowledge on the concepts of Correlation and calculate the coefficients.
4. Acquire the knowledge on the properties of Regression and determination of coefficients.
5. Learn the basics of Probability with reference to terminology, theorems and techniques.

TEXT BOOKS

1. Gupta S. C. and Kapoor V. K. 2002.Fundamentals of Mathematical Statistics, Eleventh Edition. Sultan Chand and Sons, New Delhi.

UNIT I	Chapter 2	: Sec. 2.4 to 2.8
UNIT II	Chapter 2	: Sec. 2.13
UNIT III	Chapter 10	: Sec. 10.1 to 10.4
UNIT IV	Chapter 11	: Sec. 11.1 to 11.4
UNIT V	Chapter 3	: Sec. 3.1 to 3.5, 3.8

REFERENCE BOOK(S)

1. Freund J.E.2001. Mathematical Statistics, Prentice Hall of India, Delhi.
2. Goon A.M, Gupta M.K and Dos Gupta B. 1991.Fundamentals of Statistics, Vol-I, World Press, Calcutta.
3. Kapur J. N. 1960. Mathematical Statistics, S. Chand & Co. Ltd., New Delhi.
4. Paul G. Hoel. 1984. Introduction to Mathematical Statistics, 5th Edition. Wiley India Pvt. Ltd., Bangalore.
5. Rukmangadachari E.2012 Probability and Statistics, Pearson Education India, Delhi.

E-RESOURCES

1. http://www.ru.ac.bd/wp-content/uploads/sites/25/2019/03/201_04_01_Bijma-An-Introduction-to-Mathematical-Statistics-2017.pdf
2. https://www.google.com/searchq=mathematical+statistics+pdf&oq=mathematical+statistics&aqs=chrome.1.69i57j0l2j69i60j0l2.11386j0j7&sourceid=chrome&ie=UTF-8
3. http://math.iisc.ernet.in/~manju/UGstatprob16/statprob.pdf
4. https://www.vfu.bg/en/e-Learning/Math--Soong_Fundamentals_of_probability_and_statistics_for_engineers.pdf
5. https://projects.ncsu.edu/crsc/events/ugw06/presentations/scheywar/finalundergrad. pdf

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF MATHEMATICS

Semester: III- EDC-II(2) : Graph theory and its Applications

Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**:

OBJECTIVES

- To understand the fundamental concepts and applications of graph theory
- To learn the techniques of combinations in Graph theory
- To apply Graph theory based tools in solving practical problems

UNIT- I : Introduction and Path and Circuits (**9 Hours)**

Graph - Application of Graphs - Finite and Infinite Graphs - Incidence -Degree-Isolated Vertex- Pendent Vertex - Null Graph – Isomorphism - Subgraphs – Walks- Path-Circuits - Connected Graphs-Disconnected Graphs and Components - Euler Graphs.

UNIT-II: Path and Circuits **(8 Hours)**

Operation on Graphs -Definition for Decomposition-Deletion -Fusion - More on Euler Graphs and theorem-Arbitrarily Traceable Graphs - Hamiltonian Circuits - Hamiltonian Path -Complete Graph and Theorem.

UNIT –III: Trees and Fundamental Circuits **(10 Hours)**

Trees - Some properties of Trees - Pendant Vertices in a Tree - Distance and Centers in a Tree – Cuts-Sets - Some Properties of a cut-set - All cut-sets in a graph - Fundamental Circuits and Cut-sets - Connectivity and Separability.

UNIT- IV: Matrix Representation of Graph **(9 Hours)**

Incidence Matrix-Circuit matrix - Fundamental Circuit Matrix and Rank of B - Cut -Sets Matrix - Adjacency Matrix.

UNIT –V: Directed Graphs **(9 Hours)**

Introduction - Definition and Basic Properties - Some Applications-Connecter Problem - Kruskal's Algorithm- Shortest Path Problem - Dijkstra's Algorithm.

Total Lecture hours-45

COURSE OUTCOME

The students will be able to

1. Recognize the use of graphs and their applications.
2. Represent graphs using Hamiltonian Paths and Circuits.
3. Solve problems using basic Fundamental circuit & Cut Sets.
4. Understand the use of Matrix Representation Graphs
5. Modern real world problems using graph theory applications.

TEXT BOOKS

1. Narsingh Deo. 2011. Graph Theory with applications to Engineering and Computer Science, PHI Learning PVT. Ltd, New Delhi.
2. Arumugam. S and Ramachandran. S. 2006. Invitation to Graph Theory, SciTech Publications (India) PVT. Ltd., Chennai.

UNIT-I	Chapter 1	:	Sec. 1.1 to1.5 &
	Chapter 2	:	Sec. 2.1, 2.2, 2.4 to 2.6 of [1]
UNIT-II	Chapter 2	:	Sec.2.7 to 2.9 of [1]
UNIT-III	Chapter 3	:	Sec. 3.1 to 3.4&
	Chapter 4	:	Sec. 4.1 to 4.5of [1]
UNIT-IV	Chapter 7	:	Sec. 7.1 to 7.4, 7.6, 7.9 of [1]
UNIT-V	Chapter 10	:	Sec. 10.0, 10.1&
	Chapter 11	:	Sec 11.0, 11.1, 11.2 of [2

REFERENCE BOOK(S)

1. Balakrishnan. V.K.1997.Theory and problems of Graph Theory. MC Graw Hill Education (India) PVT. New Delhi.
2. Gary Chartrand and Ping Zhang, 2004.Introduction to Graph Theory, Tata McGraw Hill Edition.India.
3. Gary Chartrand, Linda Lesniak and Ping Zhang. 2016. Graphs and Diagraphs, CRC Press, United States
4. Jonathan L., Jay Yellen and Mark Anderson, 2019. Graph Theory and its Application, Third Edition. CRC Press, United States.
5. Richard J. Treduea. 1993. Introduction to Graph Theory. Dover Publications, New York.

E-RESOURCES

1. http://empresa.bellarica.org
2. http://math.stackexchange.com
3. http://www.nrce.niepa.ac.in
4. http://meskc.ac.in
5. http://www.goodreads.com