# E.M. GOPALAKRISHNA KONE YADAVA WOMEN'S COLLEGE

**An Autonomous Institution –Affiliated to Madurai Kamaraj University**
**Re-accredited (3rd Cycle) with Grade A+ & CGPA 3.51 by NAAC**


# LESSON PLAN
# 2022-2023

## DEPARTMENT OF **MATHEMATICS**

## (PG –Even Semester)

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**DEPARTMENT OF MATHEMATICS**
**I - M.Sc., Mathematics**
**LESSON PLAN**
**2022-2023(Even)**

**Sub. Code : 22OPM21**
**Title of the Paper: Linear Algebra**
**Total Hours : 75**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | **Linear Transformations** Linear Transformations–The Algebra of Linear Transformations– Isomorphism – Representations of Transformations by Matrices – Linear Functionals. | 15 | Chalk & Talk | Selvi |
| Jan | II | **Polynomials, Determinants** Algebras-The Algebra of Polynomials –Polynomial Ideals - The Prime Factorization of a Polynomial – Commutative Rings - Determinant Functions. | 15 | Chalk & Talk | Selvi |
| Feb | III | **Determinants, Elementary Canonical Forms** Permutations and the Uniqueness of Determinants – Additional Properties of Determinants - Characteristic Values – Annihilating Polynomials. | 15 | Chalk & Talk | Selvi |
| March | IV | **Elementary Canonical Forms** Invariant Subspaces – Simultaneous Triangulations; Simultaneous Diagonalization –Direct- Sum Decompositions – Invariant Direct Sums – The Primary Decomposition Theorem. | 15 | Chalk & Talk | Selvi |
| April | V | **The Rational and Jordan Forms** Cyclic Subspaces and Annihilators– Cyclic Decompositions and the Rational Forms– The Jordan Form. | 15 | Chalk & Talk | Selvi |

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**LESSON PLAN**
**2022-2023**

**Sub. Code : 22OPM22**
**Title of the Paper: Measure and Integration**
**Total Hours : 75**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | Measure on a Real line: Lebesgue Outer Measure-Measurable Sets – Measurable Functions . | 15 | Chalk & Talk | T. Thuj' |
| Jan | II | Integration of functions of a Real line: Integration of non - negative functions- The General Integral - Integration of Series – Riemann and Lebesgue Integral. | 15 | Chalk & Talk | T. Thuj. |
| Feb | III | Abstract Measure Spaces: Measures and outer Measures-Extension of a Measure-Measure Spaces-Integration With Respect to a Measure. | 15 | Chalk & Talk | T. Thuj |
| March | IV | Inequalities and the $L^p$ Spaces: The $L^p$ spaces -Convex functions – Jensen's Inequality- The Inqualities of Holder and Minkowski. | 15 | Chalk & Talk | T. Thuj. |
| April | V | Singed Measures and their Derivatives: Signed measures and the Hahn Decomposition – The Jordan Decomposition- The Radon – Nikodym theorem | 15 | Chalk & Talk | T. Thuj. |

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**2022-2023**

**Sub. Code : 22OPM23**
**Title of the Paper: Graph Theory with Applications**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | **Graphs and Subgraphs** Definition and Examples of a Graph – Simple Graphs - Graphs Isomorphism- The Incidence and Adjacency Matrices - Subgraphs – Vertex Degrees – Paths and Connection– Cycles - Trees - Cut Edges and Bonds – Cut Vertices – Cayley's Formula( Applications ) -The Connector Problem. | 18 | Chalk & Talk | R - Revathy |
| Jan | II | **Connectivity** Connectivity – Blocks (Applications) - Construction of Reliable Communication Networks | 18 | Chalk & Talk | R - Revathy |
| Feb | III | **Euler Tours and Hamilton Cycles** Euler Tours - Hamilton Cycles (Applications) - The Chinese Postman Problem – The Travelling Salesman Problem. | 18 | Chalk & Talk | R - Revathy |
| March | IV | **Directed Graphs** Directed Graphs - Directed Paths - Directed Cycles (Applications) – A Job sequencing Problem - Designing an Efficient Computer Drum - Making a Road System One–way - Ranking the Participants in Tournament. | 18 | Chalk & Talk | R. Revathy |
| April | V | **Networks** Flows-Cuts-The Max-Flow Min-Cut Theorem (Applications)–Menger's Theorems - Feasible Flows | 18 | Chalk & Talk | R. Revathy |

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**Sub. Code : 22OPM24**
**Title of the Paper: Advanced Statistics - II**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | Probablitiy and Distributions<br>Introduction – Set Theory – The Probability Set Function – Conditional Probability and Independence – Random Variables of the Discrete Type – Random Variables of the Continuous Type – Properties of the Distribution Function – Expectation of a Random Variable – Some Special Expectations – Chebyshev's Inequality . | 18 | Chalk & Talk | |
| Jan | II | Multivariate Distributions<br>Distributions of Two Random Variables – Conditional Distributions and Expectations – The Correlation Coefficient – Independent Random Variables – Extension to Several Random Variables. | 18 | Chalk & Talk | |
| Feb | III | Some Special Distributions<br>The Binomial and Related Distributions – The Poisson Distribution – The Gamma and Chisquare Distributions – The Normal Distribution – The Bivariate Normal Distribution. | 18 | Chalk & Talk | |
| March | IV | Distributions of Funcions of Random Variables<br>Sampling Theory – Transformations of Variables of the Discrete Type – Transformations of Variables of Continuous Type – The Beta, t and F Distributions – Extensions of the Change of Variables Technique – Distributions of Order Statistics – The Moment Generating Function Technique – The Distributions of $\overline{X}$ and $nS^2/\square^2$ – Expectations of Functions of Random Variables.. | 18 | Chalk & Talk | |
| April | V | Limiting Distributions<br>Convergence in Distribution – Convergence in Probability – Limiting Moment Generating Functions – The Central Limit Theorem – Some Theorems on Limiting Distributions. | 18 | Chalk & Talk | |

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**Sub. Code : 22OPMEDSE2A**
**Title of the Paper: Fuzzy sets and logics**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | Introduction ,Crisp Sets: An Overview, The Notation of Fuzzy Sets, Basic Concepts of Fuzzy Sets, Classical Logic: An Overview, Fuzzy Logic | 18 | Chalk & Talk | A. Manickavally |
| Jan | II | General Discussion, Fuzzy Complement, Fuzzy Union, Fuzzy Intersection, Combinations of Operations, General Aggregation Operations. | 18 | Chalk & Talk | A. Manickavally |
| Feb | III | Crisp and Fuzzy Relations, Binary Relations, Binary Relations On a Single Set, Equivalence and Similarity Relations. | 18 | Chalk & Talk | A. Manickavally |
| March | IV | Compatibility or Tolerance Relations, Orderings | 18 | Chalk & Talk | A. Manickavally |
| April | V | Morphisms, Fuzzy Relation Equations | 18 | Chalk & Talk | A. Manickavally |

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**Sub. Code : 21OPMAID22**
**Title of the Paper: Teaching and Research Aptitude Paper - II**
**Total Hours : 30**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | **Data Interpretations:** Sources of data – Acquisition of Data – Discrimination of Data | 6 | Chalk & Talk | A. Rayani |
| Jan | II | **Data Interpretations:** Collection of data – Representation of data - Interpretation of data | 6 | Chalk & Talk | A Rayani |
| Feb | III | **Information and communication Technology:** Application of Information Technology in Modern World – Data and Information –Value Of Information – Quality of Information – Aims of Information – Need and Importance of Information – Role of Information. | 6 | Chalk & Talk | A. Rayani |
| March | IV | **Information and communication Technology:** Evolution of Computer – Computer Generations – Structure of Modern Computer – Objectives of ERNET – Terminology Related to Computer. | 6 | Chalk & Talk | A. Rayani |
| April | V | **Higher Education System:** Value Education – Scriptural Value System and Operational Value System –Type of Values – Value system and Mental Health – The need of Value Education – Value and Science. | 6 | Chalk & Talk | A. Rayani |

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**Sub. Code : 21OPM41**
**Title of the Paper: Advanced Topology**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | **Local compactness:** Local compactness - The Tychonoff theorem - The Stone-Cech Compactification. | 18 | Chalk & Talk | |
| Jan | II | **Metrization theorems:** Local finiteness -The Nagata-Smirnov metrization theorem - The Smirnov metrization theorem | 18 | Chalk & Talk | |
| Feb | III | **Complete metric spaces and Function Spaces:** Complete Metric Spaces - A Space- Filling Curve - Compactness in Metric Spaces. | 18 | Chalk & Talk | |
| March | IV | **Complete metric spaces and Function Spaces:** Pointwise and Compact Convergence - Ascoli's Theorem. | 18 | Chalk & Talk | |
| April | V | **Baire spaces and Dimension Theory :** Baire Spaces - A Nowhere Differentiable Function | 18 | Chalk & Talk | |

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**Sub. Code : 21OPM42**
**Title of the Paper: Research Methodology of Mathematical Methods**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | What is Research in Mathematics?-Fixing an area for research, Proof Techniques- Pure and Applied Mathematics Research – Articles (popular Technical, Review, Survey) Magazines, Journals-Websites related to Mathematical articles and software(free and commercial),Mathematical and Statistical Societies (National and International), Prizes and Medals in Mathematics. | 18 | Chalk & Talk | |
| Jan | II | **INTRODUCTION:** Introduction- Types of Kernel-Eigen values and eigen function – differentiation under the sign of integration(Leibtnz's rule) – connection with differential equation – solution of an integral equation –conversion of differential equation to Integral equation: Intial value problem – boundary value problem | 18 | Chalk & Talk | |
| Feb | III | **Solution of Fredholm integral equations** :Solution of Fredholm integral equations:Solution of homogeneous Fredholm integral equation of the second kind with separable (degenerate)kernel-Orthogonality and reality of eigen functions –Fredholm integral equation with separable kernel. | 18 | Chalk & Talk | |

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| March | IV | **Solution of integral equations of second kind:Successive Approximation and Substitution Methods**:Introduction -Solution of Fredholm integral equations of second kind by successive Substitution –solution of Volterra integral equation of the second kind by successive substitution – solution of fredholm integral equation of the second kind by successive approximation | 18 | Chalk & Talk | |
| April | V | **Solution of integral equations of second kind:Successive Approximation and Substitution Methods:** Volterra's solution of fredholm integral equation of the second kind – solution of volterra integral equation of second kind by successive approximation – Newmann series –some particular cases – reduction of Volterra integral equation in to differential equation-reduction of Volterra integral equation of first kind to a Volterra integral equation of second kind | 18 | Chalk & Talk | |

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**Sub. Code : 21OPM43**
**Title of the Paper: Functional Analysis**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | The Definition and Examples of Banach Spaces Continuous Linear Transformation. The Hahn Banach spaces | 18 | Chalk & Talk | |
| Jan | II | The Natural Imbedding of N and $N^{**}$- The Open Mapping Theorem – The Conjugate of an Operator | 18 | Chalk & Talk | |
| Feb | III | Properties of Orthogonal Sets | 18 | Chalk & Talk | |
| Feb | IV | The Conjugate space $H^*$ - Adjoint of an operator – Self adjoint operator - Normal and Unitary Operators - Projections | 18 | Chalk & Talk | |
| March | V | The Weierstrass Approximation theorem - The Stone Weierstrass theorem – Locally Compact Hausdorff spaces – The Extended Stone Weierstrass theorem | 18 | Chalk & Talk | |

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**Sub. Code : 21OPM44**
**Title of the Paper: Operations Research**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | **Network Models:** Network Definitions - Minimal Spanning Tree Algorithm – Shortest Route Problem - Examples of the Shortest –Route Applications - Shortest Route Algorithms- Maximal Flow Model - Enumeration of Cuts – Maximal Flow Algorithm- | 18 | Chalk & Talk | M. Kally |
| Jan | II | **Network Models:** Minimum - Cost Capacitated Flow Problem - Network Representation -Linear Programming Formulation - Capacitated Network Simplex Algorithm –CPM and PERT- Network Representation – Critical Path(CPM) Computations - Construction of the Time Schedule. | 18 | Chalk & Talk | M. Kavitha |
| Feb | III | **Queuing Systems:** Elements of a Queuing Model - Role of Exponential Distribution - Pure Birth and Death Models-Pure Birth Models- Pure Death Model - Generalized Poisson Queuing Model - Specialized Poisson Queues – Steady – State Measures of Performance – Single – Server Models – Multiple –Server Models – Machine Servicing Model (M/M/R) : (GD/K/K), R < K. | 18 | Chalk & Talk | M. Kavitha |

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|---|---|---|---|---|---|
| March | IV | **Classical Optimization Theory:** Unconstrained Problems-Necessary and Sufficient Conditions-The Network – Raphson Method-Constrained Problems-Equality Constraints – Inequality Constraint | 18 | Chalk & Talk | |
| April | V | **Nonlinear Programming Algorithms:** Unconstrained Algorithms - Direct Search Method -Gradient Method-. Constrained Algorithms - Separable Programming - Quadratic Programming- Geometric Programming- Stochastic Programming -Linear Combinations Method. | 18 | Chalk & Talk | |

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**2022-2023**

**Sub. Code : 21OPME4A**
**Title of the Paper: Discrete Mathematics**
**Total Hours : 90**

| Month | Unit | Description Of The Syllabus | Hours Allocated | Teaching Mode & Methods | Course Teacher |
|---|---|---|---|---|---|
| Dec | I | The Foundations:LOGIC and PROOFS, Sets and Functions:: Logic-Propositional Equivalences-Predicates and Quantifiers-Nest Quantifiers—Methods of Proof .The Fundamentals Algorithms, the integers and Matrices, Algorithms –The Growth of functions. | 18 | Chalk & Talk | N. Uma Maheswari |
| Jan | II | Counting: The Basics of Counting - The Pigeonhole Principle - Permutations and Combinations - Generalized Permutations and Combinations - Generating Permutations and Combinations | 18 | Chalk & Talk | N. Uma Maheswari |
| Feb | III | Advanced Counting Techniques –Recurrence Relations –Solving Recurrence Relations –Divide and Conquer Algorithms and Recurrence Relations – Generating Functions – Inclusion –Exclusion – Applications of Inclusion - Exclusion | 18 | Chalk & Talk | N. Uma Maheswari |

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|---|---|---|---|---|---|
| March | IV | Boolean Algebras: Lattices and Algebraic Systems- Principle of Duality-Basic Properties of Algebraic Systems Defined by Lattices-Distributive and Complemented Lattices-Boolean Lattices and Boolean Algebras | 18 | Chalk & Talk | N. Uma Maheswari |
| April | V | Boolean Algebras(cont) : Uniqueness of finite Boolean Algebras-Boolean Functions and Boolean Expressions – Propositional Calculus-Design and Implementation of Digital Networks-Switching Circuits | 18 | Chalk & Talk | N. Uma Maheswari |

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