# Faculty of Engineering & Technology
# Master of Technology (M. Tech)
# (W. E. F.: 2023-24)

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| **Name of Faculty** | : | Faculty of Engineering & Technology |
| **Name of Program** | : | Master of Technology (M. Tech) |
| **Course Code** | : | 1MLA01 |
| **Course Title** | : | Linear Algebra & Optimization |
| **Type of Course** | : | BS |
| **Year of Introduction** | : | 2023-24 |

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|---|---|---|
| **Prerequisite** | : | Higher Engineering Mathematics |
| **Course Objective** | : | The problem formulation by using linear, dynamic programming, game theory and queuing models. |
| **Course Outcomes** | : | At the end of this course, students will be able to: |
| | CO1 | **To Understand** the connection between matrices and linear transformations. |
| | CO2 | **To Understand** the concepts of vector spaces, subspaces, bases, dimension and their properties. |
| | CO3 | **To Analyze** matrices and linear transformations; compute Eigen values and Eigen vectors of linear transformations Interpret existence and Uniqueness of solution geometrically. |
| | CO4 | **To Understand** the connection between matrix transformations and linear transformations. Find the image of a vector under a transformation. Find the standard matrix of a linear transformation. |
| | CO5 | **To Apply** the theory of optimization methods and algorithms to develop and for solving various types of optimization problems. Ability to go in research by applying optimization techniques in problems of Engineering and Technology. |

**Teaching and Examination Scheme**

| Teaching Scheme (Contact Hours) | | | Credits | Examination Marks | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | Total Marks |
| L | T | P | C | SEE | CIA | SEE | CIA | |
| 3 | 2 | 0 | 4 | 70 | 30 | 30 | 20 | 150 |

*Legends: **L**-Lecture; **T**–Tutorial/Teacher Guided Theory Practice; **P**–Practical, **C** – Credit, **SEE** – Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))*

**Course Content**

| Module No. | Topics | Teaching Hours | Weightage | Mapping with CO |
|---|---|---|---|---|
| 1 | **Matrix Analysis:** Basic Concepts, type of matrices, scalar multiplication, matrix multiplication, properties, inverse, system of linear equations. | 8 | 18% | CO2, CO4 |
| 2 | **Vector Space:** Vector Space, Subspace ,Linear Combination, Linear Independence , Basis, Dimension, Finding a Basis of a Vector Space , Coordinates, Change of Basis | 9 | 20% | CO3 |
| 3 | **Eigen values and Eigen vectors** Definition of Eigen value and Eigenvector, Diagonalization, Symmetric Matrices and Orthogonal Diagonalization | 7 | 16% | CO3 |
| 4 | **Linear Transformations:** Linear Transformations and Matrices for Linear Transformation, Kernel and Range of a Linear Transformations | 10 | 22% | CO1 |
| 5 | **Optimization:** Maxima and minima, saddle point, Lagrange's method of undetermined multipliers and their applications, non-linear optimization, Kuhn-Tucker condition, Fibonacci search, quadratic interpolation optimization, evolutionary algorithms. | 11 | 24% | CO1, CO5 |

| Suggested Distribution of Theory Marks Using Bloom's Taxonomy | | | | | | |
|---|---|---|---|---|---|---|
| **Level** | Remembrance | Understanding | Application | Analyse | Evaluate | Create |
| **Weightage** | **15** | **35** | **50** | **00** | **00** | **00** |

*NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.*

**Reference Books**

| Sr. No. | Name of Reference Books |
|---|---|
| 1 | Introduction to Linear Algebra 5th Edition by Gilbert Strang. |
| 2 | No bullshit guide to linear algebra by Ivan Savov. |
| 3 | Rao S. S. – 'Engineering Optimization, Theory and Practice' – New Age International Publishers – 2012 – 4th Edition |

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| 4 | Linear Algebra: Step by Step by Kuldeep Singh. |
| 5 | Linear Algebra Done Right 3rd Edition by Sheldon Axler. |

**List of Journals / Periodicals / Magazines / Newspapers / Web resources, etc**

| Sr. No. | Name of Journals / Periodicals / Magazines / Newspapers / Web resources, etc |
|---|---|
| 1 | https://en.wikipedia.org/wiki/Linear_Algebra_and_Its_Applications |
| 2 | https://www.sciencedirect.com/journal/linear-algebra-and-its-applications |