

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level
MAT	1228	Linear Algebra and ODE	5	4	0	2	10	MAT 1116	5

## Topics Outline

- 1. Matrices and Gauss Elimination:** Linear Equation and Systems, Matrix Notations and Operations, Method of Elimination, Row and Row Reduced Echelon Form of a Matrix, Inverse of Square Matrix by Gauss Elimination.
- 2. Determinants and Eigenvalues:** Determinants and their Properties, Cofactor Expansions, Cramer's Rule, Characteristic Polynomial of a Square Matrix, Eigenvalues and Eigenvectors of a Square Matrix.
- 3. First Order Differential Equations:** Introduction and First Definitions, Initial Value Problems, Differential Equations as Mathematical Models, Separable Equations, First Order Linear Equations, Exact Differential Equations, Homogeneous Differential Equations, Bernoulli Equations.
- 4. Second Order Linear Differential Equations with Constant Coefficients:** General Solution of the Homogeneous Equation, Reduction of the Order Method, Particular Solution of the Nonhomogeneous Equation, The Undetermined Coefficients and Variation of Constants Methods, Variation of Parameters Method, Euler-Cauchy Equation, Some Applications: Damped Free and Forced Vibrations, Mechanical Vibrations.
- 5. Systems of First Order Linear Differential Equations:** Linear System in Normal Form, Homogeneous Systems of Linear Differential Equations with Constant Coefficients, Modeling with Systems of First-Order ODEs.

## Required Textbook

*Linear Algebra, Gareth Williams*, 6<sup>th</sup> Edition, Jones and Bartlett, 2008.

*Fundamentals of Differential Equations*, 6<sup>th</sup> Edition, R. Nagle, E. Saff and A. Snider;

## Other references

- *Linear Algebra with Application*, 5<sup>th</sup> Edition; W. K. Nicholson, McGraw- Hill, 2006.
- *A first course in differential equations with modelling applications*, 10<sup>th</sup> Edition, Dennis G. Zill, Cengage Learning, 2013.
- *Elementary Differential Equations and Boundary Value Problems*, 9<sup>th</sup> Edition, W. Boyce, R. DiPrima, John Wiley & Sons, 2010.