ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

DEPARTMENT OF MATHEMATICS

Academic year 2022/23

Course Outline: Applied Mathematics IB (Math 1041)

Chapter 1: Vectors and Vector Spaces

1. Scalars and Vectors; Located and position vectors in R^2 and R^3
2. Addition and Scalar Multiplication
3. Dot (Scalar) Product: Magnitude of a vector, Angle between two vectors, Orthogonal projection, Direction Cosines.
4. Cross (Vector) product; Triple products with applications
5. Lines and Planes in R^3
6. Vector Spaces; Subspaces
7. Linear Dependence and Independence of vectors
8. Basis and Dimension of a Vector Space

Chapter 2: Matrices, Determinants and Systems of Linear Equations

1. Definition of a matrix and basic operations
2. Product of matrices and some properties; transpose of a matrix
3. Elementary row operations and echelon forms
4. Rank of a matrix
5. Inverse of a matrix and its properties
6. Determinant of a matrix and its properties
7. System of linear equations; Gauss's Method; Cramer's rule; Characterization of solutions
8. Eigenvalues and eigenvectors

Chapter 3: Limit and Continuity

1. Definition of Limit
2. Examples of limit of a function (linear, quadratic, rational with linear denominator)
3. Basic Limit Theorems
4. One-Sided limits
5. Infinite limits;limit at infinity and asymptotes
6. Continuity of a function; One-sided Continuity; Intermediate Value Theorem

Chapter 4: Derivatives and Application of derivatives

1. Definition, examples and properties; Basic rules; The Chain rule
2. Derivatives of inverse functions, Inverse trigonometric, Hyperbolic and inverse hyperbolic functions

3. Implicit differentiation; Higher-order derivatives
4. Applications of the derivative: Exterma of a function; Mean Value Theorem; First and Second Derivative Tests; Concavity and inflection points; Curve sketching;
5. Indeterminate forms and L'Hopital's rule

Chapter 5: Integration

1. Antiderivatives; Indefinite integrals
2. Techniques of integration: Integration by substitution and Integration by parts, trigonometric integrals; Integration by Trigonometric substitution; Integration by partial fractions
3. Definite integrals: Fundamental Theorem of Calculus
4. Application of the integral: Area (Review). Volume of solid of revolution; Arc length
5. Improper integrals

Text Books:

1. Robert Ellis and Denny Gulick, ***Calculus with analytic geometry***, 6th ed, Harcourt Brace Jovanovich, Publishers, 5th ed, 1993.
2. Demissu Gemeda**:** ***An Introduction to Linear Algebra*****, 2000,** Department of Mathematics, AAU.
3. Serge Lang**:** ***Linear Algebra*****,** 1974, Springer Science + Business Media Inc.

References:

1. Johnson and Kiokemister: *Calculus with Analytic Geometry*
2. Howard Anton: *Calculus with Analytic Geometry,* 2000, Anton Text Books, Inc.
3. James Stewart: *Calculus,* 2009, Thomson Brooks/Cole.
4. Semu Mitiku Kassa, Berhanu Guta Wordofa and Tilahun Abebaw Kebede, *Engineering Mathematics I*, Galaxy University Books Series, 2017.
5. Bizuneh Minda, Temesgen Alemu, Getachew Bitew, Tilahun Esayiyas, and Addisu W/Meskel, University Mathematics I, Revised Edition, 2016.
6. H. Anton and C Rorres, ***Elementary linear algebra***, 1994, John Wiley & Sons, Inc.

Assessment methods of the course

- Continuous Assessment ……. 50%
  - Minimum two Assignments……..20%
  - Tests and quizzes (at least two) ….……..30%
- Final ……. 50%