MATH 1.1: LINEAR ALGEBRA

I. Course description:

1. Credit points: 3 ECTS

2. Time commitment:

Items	Lecture	Tutorial	Practical	**Total**
No. of hours	20	20	0	**40**

3. Prerequisites: None

4. Recommended background knowledge: College algebra.

5. Subject description:

Linear algebra is a fundamental mathematical tool used extensively in science and engineering disciplines. This course provides students with fundamental concepts of linear algebra: vectors, matrices, and the four important matrix subspaces, solving linear equations, matrix projection and diagonalization. Students will also be introduced to different applications of linear algebra.

6. Objectives & Outcome:

- Have a good understanding of the fundamental concepts of linear algebra, especially linear combinations, and the relationship among four matrix subspaces.
- Be able to solve linear equations for a complete solution
- Be able to use matrix projection to perform least square approximation and matrix orthogonalization
- Be able to perform singular value decomposition and understand its important in science and engineering
- Be exposed to some key applications of linear algebra.

7. Assessment/ Evaluation

Component	Attendance	Exercises	Assignments	Reports	Midterm	Final
Percentage %	10	20	0	0	20	50

8. Prescribed Textbook(s)

[1]. Ron Larson, Elementary Linear Algebra, 4th edition, Cengage Learning, 2016 (IBSN-10: 9781305658004).

II. Course content & schedule:

1. Matrices and Gauss Eliminations
   - Linear Equations and elimination
   - Matrices and operations
   - Applicationss
2. Linear Equations
   - Inverse and Transpose matrices
   - Vectors Spaces and Subspaces
   - Linear Equations
3. Vector spaces
   - Linear Independence, Basis, Dimension
   - Four fundamental subspaces
4. Vector Spaces
   - Linear Transformations
   - Matrice of Linear Transformation
5. Orthogonality
   - Orthogonal Vectors and Subspaces
   - Orthonormal basis, Gram-Schmidt
6. Determinant
   - Properties, calculations
   - Applications
7. Mid-term exam
8. Egenvalues and eigenvactors
   - Diagonalization of a Matrix
   - Symmetric Matrices
9. Positive Definite Matrices
   - Minima, Maxima, saddle points
   - Singular Value Decomposition (SVD)
10. Some computations
    - Computation of Eigenvalues
    - Iterated Methods for Solving Linear Equations
11. Some applications

- Linear innequalities
- Game theory

12. Review

III. Reference Literature:

[1] Gilber Strang, Introduction to Linear Algebra., 4th edition, Wellesley-Cambridge Press, MA, 2009