



Co-funded by the  
Erasmus+ Programme  
of the European Union

## Deliverable 1.1: Document describing topics to be integrated into Linear Algebra and Calculus I curricula

### An Introduction

Teaching real-life applications provides students with meaning and context for their learning. By using real-life math applications, students can make connections between math and everyday life. Mathematics are around us!!! ALL occupations use math every day in many different ways. Whether we're looking at patterns or problem solving, so much of what we do has direct connections to math.

This document as an objective has to support the active learning in math through real life applications. The document will attempt to take down one of the myths in Mathematics that are not linked with the real life. The key to understanding math is making sense of it. Many students believe that math is a set of formulas that rely on working memory; this belief is often associated with low achievement. At its core, math is creative. It's about visualizing patterns and creating solution paths that others can see, discuss and critique.

It describes the real life problems is used along fundamental definitions are taught during the 1<sup>st</sup> year modules in Linear Algebra I and Calculus I in the Departments of Electronic Engineering and Electrical & Computer Engineering. In this document we present the titles of the real life examples are provided and with what fundamental definitions are linked.

### Linear Algebra Concepts and Real Life Examples

Institution	Definition	Title of the Real Life Example
HMU	System of Equations	Analysis of DC Circuits

HMU	Determinants & Multiplication of Matrices	Analysis of DC Circuits
HMU	Matrices	Telecommunications: zero forcing equalizer
HMU	Multiplication of Matrices	Photonics: Design Laser Cavities
AAU	Transformation Matrix	ICT: Image Processing (scaling, rotation, and shearing) computer graphics
AAU	Matrices: Eigenvalues, eigenvectors	Face Recognition
HIT	Vector Dot Product	Prediction: The Dance in a Couple Game / how to correlate two events
HIT	Vector Dot Product	Physics & Electronics: Calculate the work done
HAC	Matrices: Linear Combinations	ICT: Image processing
UoM	Matrices: Applications of Determinants	Calculation of Areas and Volumes
KEEI	Calculations	Every Day Examples

### Calculus I and Real Life Examples

Institution	Definition	Title of the Real Life Example
HMU	Integrals	AC Circuits: Fourier Series
HMU	Integrals	Mechanics: Finding the work is required to pump liquid from a tank.
HMU	Integrals	Sports: Finding the value of the heart rate after some time of constant intensity exercise.
HMU	Derivatives	Minimization / Maximization of quantities: Maximize the area of a garden; Maximizing the revenues / Maximizing the monthly profit
FINKI	Derivatives	Finance: Online shopping transactions.
FINKI	Derivatives	Education: the tendency of SAT scores within the years
CTU	Sequence	Biology: Simple Cell Population Dynamics.

CTU	Sequence	Physics: Radioactive Decay.
CTU	Transform Z	????????
HIT	Integrals	Machine Learning: Classification of images
HIT	Limits	Astrophysics: The period of orbit of Mercury around the Sun.
HAC	Polynomials	Finance: Secret Sharing using Lagrange polynomials
KSU	Derivatives	Electrical Circuits: calculation of the maximum electrical power consumptions
KSU	Integrals	Electrical Circuits: calculation of the total power in an AC circuit.
KSU	Integrals & Derivatives	Electrical Circuits: Capacitors and Inductors & Analysis of RL, RC and RLC circuits.
UoM	Integrals	Electricity: Calculation of daily consumption of a house.
UoM	Integrals	Society: Daily life calculations
UoM	Integrals and Derivatives	Mechanics: moving objects.
University of Pristina	Functions	Examples: Surface of objects, population of earth, the cost of mailing a letter,
University of Pristina	Derivatives	Mechanics: a moving object
University of Pristina	Derivatives	Finance: DVD sales
University of Pristina	Integrals	Finance: Bicycle Sales
Universum Collegi	Limits	Finance: Values breaks
EVM (external partner)	Functions / Derivatives / Integration / Matrices	Business World & Energy Harvesting Sector

All the aforementioned examples have been uploaded into the Moodle platform and also to the sharing files of the iTEM project.