

## AFMA101 - Mathematics I

Course Title	Mathematics I				
Course Code	AFMA101				
Course Type	Compulsory				
Level	Bachelor (1 <sup>st</sup> Cycle)				
Year / Semester	1 / Fall				
Teacher's Name	PETROULA MAVRIKIOU				
ECTS	6	Lectures / week	3	Laboratories / week	
Course Purpose	<p>The purpose of this course is to provide students with basic knowledge of Business Mathematics. Students are introduced to the theory and understanding of the basic concepts of functions, linear equations, matrix algebra, inequalities in the plane, linear programming, duality and sensitivity analysis. Students learn to calculate matrix expressions and inverse matrices and to use matrices for the solution of linear systems of equations. They learn how to solve optimisation problems with the use of both graphical method and the simplex method. During the course students analyse current industry models and suggest implications of current industry techniques in production, cost, revenue and profit functions. They learn to evaluate the mathematical implications of the above techniques applied on industry models, and to offer suggestions for their better operation. Finally, they learn to formulate an optimization problem for a particular production model, solve the problem using the appropriate mathematical technique, evaluate the numerical findings and make suggestions for optimal operation.</p>				
Learning Outcomes	<ul style="list-style-type: none"> <li>• Recognize different kinds of functions. Solve simple equations and manipulate basic functions (exponential, logarithmic etc).</li> <li>• Draw simple graphs of the functions (equation of the straight line).</li> <li>• Understand the concept of a matrix.</li> <li>• Perform operations on matrices (addition, subtraction, multiplication, division).</li> <li>• Recognize special matrices (Identity, Square etc.).</li> <li>• Find the inverse of a square matrix.</li> <li>• Apply the inverse matrix method for the solution of systems of linear equations.</li> <li>• Calculate the determinant of a matrix. Solve systems of linear equations using the methods of Cramer's (determinants), substitution, elimination, comparison).</li> <li>• Formulate models of realistic situations and solve the leading to systems of linear equations.</li> </ul>				

	<ul style="list-style-type: none"> <li>• Understand the concept of the straight line. Identify the slope and the y-intercept. Draw the straight line.</li> <li>• Solve Linear Programming exercises using the graphical method (minimization and maximization).</li> <li>• Formulate Linear Programming models for realistic situations and solve the leading problems using the graphical method. Applications in Business and complicated problems.</li> <li>• Solve Linear Programming problems using the SIMPLEX method (minimization and maximization).</li> <li>• Recognize the dual problem and perform sensitivity analysis.</li> </ul>		
Prerequisites	None	Corequisites	None
Course Content	<ul style="list-style-type: none"> <li>• Review of basic Algebra</li> </ul> <p>Functions-nature and notation, types of functions, (linear, quadratic, cubic, polynomial, rational, exponential, logarithmic). Graphical representation. Linear Equations and analytical geometry of the straight line. Linear functions.</p> <ul style="list-style-type: none"> <li>• Matrices</li> </ul> <p>The concept of a matrix. Types and properties of matrices. Transpose, inverse, symmetric, and identity matrix. Matrix algebra. Addition, subtraction, division, multiplication. Square matrices. The determinant of a matrix. Cofactor matrix.</p> <ul style="list-style-type: none"> <li>• Simultaneous Equations</li> </ul> <p>Solving simultaneous equations using the method of elimination, comparison and substitution. Use of the inverse matrices to solve systems of linear equations (two or three unknowns). Use Cramer's method to solve systems of linear equations (two or three unknowns). Applications in business problems.</p> <ul style="list-style-type: none"> <li>• Linear Programming in the plane</li> </ul> <p>Inequalities in the plane. Introduction to Linear Programming. Graphical solutions for maximization and minimization. Applications in business problems. Special cases (no feasible region, unboundness and multiple solutions).</p> <ul style="list-style-type: none"> <li>• Advance Linear Programming</li> </ul> <p>Further linear programming. Formulation of more complicated problems. Applications in business problems.</p> <ul style="list-style-type: none"> <li>• Linear programming in 3-dimensions.</li> </ul> <p>The Simplex Method. Duality and Sensitivity Analysis.</p>		
Teaching Methodology	<p>The course is structured around lectures and tutorials on topics related to business mathematics. During the lectures, students are encouraged to participate in discussions and class work. At the same time, students are given problems and exercises to solve at home.</p>		

Bibliography	<p><u>(a) Textbook</u></p> <ul style="list-style-type: none"> <li>• Barnett R., Ziegler M., Byleen K., College Mathematics for Business, Economics, Life Sciences and Social Sciences. Pearson Prentice Hall 2018, 14<sup>th</sup> Edition (Latest Edition).</li> </ul> <p><u>(b) References</u></p> <ul style="list-style-type: none"> <li>• Anton, H., and Kolman, A., Mathematics with Applications for the Management, Life and Social Sciences, 4th edition, Wiley, 2018, 12<sup>th</sup> Edition (Latest Edition)</li> <li>• Anderson, D., Sweeney D., Williams, T., Quantitative Methods for Business, 9th Edition, West Publishing Company 2006</li> <li>• Edward Dowling, Introduction to Mathematical Economics, McGraw-Hill 2001.</li> <li>• Mizrahi and Sullivan, Finite Mathematics with Applications, John Wiley and Sons</li> </ul>
Assessment	Students are assessed with the Coursework which is consisted of two Mid-term exams carrying 40% weight, and a Final exam which carries 60% weight.
Language	English