Course unit title:	Differential Equations		
Course unit code:	AMAT 204		
Type of course unit:			
Level of course unit:	Bachelor		
Year of study:			
Semester when the unit is delivered:			
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Dr. Marios Charalambides, Unit Leader: Dr. Giannis Christodoulides		
Learning outcomes of the course unit:	▪ Define and explain the concept of an ordinary differential equation, employ the appropriate method to solve Separable, Linear, Homogeneous and solution by substitution, and Exact first-order differential equations. ▪ Define the concept of second order linear ordinary differential equations, describe the general method of their solution, and calculate the general solution of second-order homogeneous differential equations with constants coefficients. ▪ Describe the method of Reduction of Order in the solution of second order homogeneous differential equations, and employ the method to obtain the second linearly independent solution. ▪ Describe the Methods of Undetermined Coefficients, and Variation of Parameters, use these methods to find the general solution of second-order non-homogeneous differential equations, and compare the two methods identifying their advantages and disadvantages. ▪ Explain the concept of Power Series expansions as solutions of linear differential equations, employ the method to obtain solutions of non-homogeneous differential equations that arise in applied engineering problems, and compare the method with the methods of undetermined coefficients and variation of parameters. ▪ Identify the importance of the method of Laplace transform in the solution of differential equations, employ the method to obtain solutions of important differential equations, and compare the results with the ones given by previous methods wherever this is possible. ▪ Define partial differential equations, and apply the method of Separation of Variables on partial differential equations to deduce a system of ordinary differential equations. ▪ Use readily available Matlab codes to calculate solutions of differential equations that arise in Applied Engineering Problems, and compare the results with the analytic solutions obtained with the techniques learned in the course.		
Mode of delivery:	Face-to-face		
Prerequisites:	AMAT 122, AMAT181	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	▪ **First Order Ordinary Differential Equations:** Basic concepts and classification of differential equations. Separable, linear with integrating factor, homogeneous or solution by substitution and exact, ordinary differential equations, Applications of First-Order Differential Equations. ▪ **Second and nth-Order Ordinary Differential Equations:** Linear homogeneous with constant coefficients, nth-order linear homogeneous		

	with constant coefficients. The method of reduction of order, the method of undetermined coefficients, and the method of variation of parameters. Initial value problems and applications of second order linear ordinary differential equations. ▪ **Series of Solutions:** Definition and properties, convergence, and solution of linear differential equations with constant and non constant coefficients. ▪ **Laplace Transform:** Definition and properties, partial fractions, Laplace transform and inverse Laplace transform. Solution of linear differential equations with constant coefficients. ▪ **Partial Differential Equations:** Basic concepts and classification. Introduction to separation of variables. ▪ **Applied Engineering Problems using MATLAB:** Calculation of solutions with readily available codes and analysis of results.
Recommended and/or required reading:	None
Textbooks:	▪ William E. Boyce, Richard C. DiPrima, ***Elementary Differential Equations and Boundary value problems***, Wiley, 9th edition, 2008.
References:	▪ B.R. Hunt, R.L.Lipsman, J.E. Osborn, J. Rosenberg, ***Differential Equations with Matlab***, Wiley, 2nd edition, 2005. ▪ C.H. Edwards, D.E. Penny, ***Differential Equations, Computing and Modeling***, Prentice-Hall, 4th edition, 2007. ▪ Kent R. Nagle, et al, ***Fundamentals of Differential Equations***, 1999.
Planned learning activities and teaching methods:	The method of interactive teaching is used for the delivery of the teaching material. A variety of strategies are employed to ensure that all students have equal opportunities to learn. The lesson plans are carried out in several ways such as by questioning, explaining, collaborating and demonstrating. Students can take in class lecture notes and are given additional practice problems either in class or through the website.
Assessment methods and criteria:	▪ Tests: 40% ▪ Final Exam 60%
Language of instruction:	English
Work placement(s):	No