MODULE SPECIFICATION

Part 1: Information			
Module Title	Engineering Mathematics 2 (PBL)		
Module Code	UFMFKP-15-2	Level	Level 5
For implementation from	2018-19		
UWE Credit Rating	15	ECTS Credit Rating	7.5
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Contributes towards			
Module type:	Standard		
Pre-requisites	Engineering Mathematics 2018-19		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Educational Aims: See Learning Outcomes

Outline Syllabus: Numerical Methods for Partial Differential Equations (PDE)
Finite differences: formulae for first and second order derivatives; schemes for one and two-dimensional elliptic BVP (e.g. Poisson's equation).
Solving linear equations: tri-diagonal system via LU factorisation; Jacobi and Gauss-Seidel methods.

Numerical Software
Basic syntax; commands and simple programs; reading documentation for a given function; using basic functionality to do relevant computations (e.g. Fourier coefficients, function values, series solution of ODE and PDE, solving linear systems).

Analytical Methods for PDE
Fourier series: periodic functions; odd/even functions; representation via Fourier series; convergence of Fourier series; Fourier sine/cosine series.
2nd order ODE: review; eigenvalue boundary value problems (BVP). PDE: examples in applied context; solution via separation of variables technique (e.g. Laplace's equation).

Linear Systems
Linear systems of differential equations: spectral solution (via eigenvalues and eigenvectors); stability (concept and determination via eigenvalues); state-feedback control; pole-placement; stabilization.
Input-Output systems: transfer function; stability (concept and determination via poles); output response.

Teaching and Learning Methods: Students will encounter a variety of more advanced mathematical techniques used to model and analyse engineering problems through strongly context based learning. The problem based learning strategy adopted in this module will introduce the mathematical topics in an engineering context. This will motivate students to understand theoretical principles and concepts as practising engineers. At the same time students will be able to demonstrate understanding of the material and be able to apply the methods and techniques in a variety of contexts.

Part 3: Assessment

Component A: Assessed by end of semester exam. The examination is summative and assesses the students' understanding of concepts, methods and techniques, and their ability to apply them in solving relevant problems, focussed on automotive engineering applications. Students will be given a structured extended investigation to work on independently prior to the examination. The examination will involve students being assessed on this work by an application focussed question in the exam.

Component B: The coursework will encourage early engagement with the module and to provide timely feedback to help identify strengths and weaknesses.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Online Assignment - Component B		25 %	Coursework (dewis e-assessment)
Examination - Component A	✓	75 %	Written examination (2 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Online Assignment - Component B		25 %	Coursework (dewis e-assessment)
Examination - Component A	✓	75 %	Written examination (2 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will be able to:

	Module Learning Outcomes
MO1	Demonstrate competency in using state-space or transform-domain techniques to understand the quantitative and qualitative behaviour of linear systems of differential equations
MO2	Demonstrate competency in the computation of Fourier series of periodic functions or analytical solution of certain partial differential equations via separation of variables and Fourier techniques
MO3	Demonstrate competency in formulating finite-difference schemes for certain ordinary or partial differential equations and using an appropriate numerical method to solve associated systems of linear equations
MO4	Provide valid interpretations of mathematical concepts and solutions in a given mathematical or physical context

Contact Hours

Contact Hours	
Independent Study Hours:	
Independent study/self-guided study	114
Total Independent Study Hours:	114
Scheduled Learning and Teaching Hours:	
Face-to-face learning	36
Total Scheduled Learning and Teaching Hours:	36
Hours to be allocated	150
Allocated Hours	150

Reading List

The reading list for this module can be accessed via the following link:

https://uwe.rl.talis.com/modules/ufmfkp-15-2.html