Module Code	MAU22E01
Module Name	Engineering Mathematics III
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Associate Prof. Dmitri Zaitsev
Module Learning Outcomes **with reference to the** Graduate Attributes **and how they are developed in discipline**	Learning outcomes Upon completion of this module, students will be able to: LO1. Pass effectively between linear systems, linear transformations and their matrices. LO2. Analyse a system of vectors for linear dependence and for being a basis. LO3. Calculate dimension of a subspace. LO4. Calculate the rank and nullity of a matrix and understand their importance. LO5. Construct a basis for row, column, and null spaces of a matrix. LO6. Calculate eigenvalues and eigenvectors of matrices. LO7. Apply the Gram-Schmidt process to transform a given basis into orthogonal one. LO8. Apply methods of general and particular solutions to ordinary differential equations. LO9. Calculate the Fourier series of a given function and analyse its behaviour. L010. Apply Fourier series to solving ordinary differential equations. LO11. Calculate the Fourier transformation. **Graduate Attributes: levels of attainment** To act responsibly - Choose an item. To think independently - Choose an item. To develop continuously - Choose an item. To communicate effectively - Choose an item.

Module Content	• Euclidean n-space and n-vectors • Linear transformations and their matrices; subspaces; linear combinations of vectors; Subspaces spanned by a set of vectors; linear independence of a set of vectors • Basis and dimension; standard basis in n-space; coordinates of vectors relative to a basis • General and particular solutions for a linear system • Row, column and null space of a matrix, finding bases for them using elementary row operations, rank and nullity of a matrix • Inner products, lengths, distances and angles relative to them; • Orthogonal and orthonormal bases relative to an inner product, orthogonal projections to subspaces, Gram-Schmidt Process; • Eigenvalues and eigenvectors of square matrices • Fourier series for periodic functions, Euler formulas for the Fourier coefficients, even and odd functions, Fourier cosine and Fourier sine series for them, Fourier integral and Fourier transform
Teaching and Learning Methods	The teaching strategy is a mixture of lectures, independent and team-based homework and tutorials. The lectures present the material in traditional form, including motivation, theory and uses. The most critical phenomena and typical mistakes are emphasised. The exercises are assigned weekly and aimed to stimulate students to actively use and revise the learned material. As an important by-product, students learn how to express their way of solving problems clearly in written form. This process is controlled by grading the student solutions and discussing them in the tutorials.

Assessment Details[2]
Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Homework	Evaluation of written solution, providing feedback on mistakes and misunderstandings		10.00%	End of tutorial
Exam	Evaluation of written solutions, feedback is provided		90.00%	End of exam

Reassessment Requirements

Contact Hours and Indicative Student Workload[3]

Contact hours: 43 hours
Independent Study (preparation for course and review of materials): 25 hours
Independent Study (preparation for assessment, incl. completion of assessment): 40 hours

Recommended Reading List

Elementary Linear Algebra (with applications), Anton and Rorres, Chapters 4 - 7 Advanced Engineering Mathematics, Kreyszig, Chapter 10

Module Pre-requisite

MAU11E01 Engineering mathematics I, MAU11E02 Engineering mathematics II

Module Co-requisite

Module Website

https://www.maths.tcd.ie/~zaitsev/Eng-III-2020/index.html

Are other Schools/Departments involved in the delivery of this module? If yes,

please provide details.	
Module Approval Date	
Approved by	
Academic Start Year	September 28th 2020
Academic Year of Date	2020/2021