COURSE CODE	COURSE NAME	L	T	P	CREDIT	YEAR OF INTRODUCTION
101908/MA100A	LINEAR ALGEBRA AND CALCULUS	3	1	0	4	2021

1. Preamble

This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarizes students with some basic techniques in matrix theory which are essential for analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analyzing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.

2. Prerequisite

A basic course in one-variable calculus and matrix theory

3. Syllabus

Module 1: Linear algebra (Text 2: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.3, 8.4)
Systems of linear equations, Solution by Gauss elimination, row echelon form and rank of a matrix, fundamental theorem for linear systems (homogeneous and non-homogeneous, without proof), Eigenvalues and eigenvectors, Diagonalization of matrices, orthogonal transformation, quadratic forms and their canonical forms.

Module 2: Multivariable calculus – Differentiation (Text 1: Relevant topics from sections 13.3, 13.4, 13.5, 13.8)

Concept of limit and continuity of functions of two variables, partial derivatives, Differentials, Local Linear approximations, chain rule, total derivative, Relative maxima and minima.

Module 3: Multivariable calculus - Integration (Text 1: Relevant topics from sections 14.1, 14.2, 14.3, 14.5, 14.6, 14.8)

Double integrals (Cartesian), reversing the order of integration, Change of coordinates (Cartesian to polar), finding areas and volume using double integrals, Triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinates (computations involving spheres, cylinders)

Module 4: Sequences and series (Text 1: Relevant topics from sections 9.1, 9.3, 9.4, 9.5, 9.6)

Convergence of sequences and series, convergence of geometric series and p-series (without proof), test of convergence (comparison, ratio, and root tests without proof); Alternating series and Leibnitz test

Module 5: Series representation of functions (Text 1: Relevant topics from sections 9.8, 9.9. Text 2: Relevant topics from sections 11.1, 11.2, 11. 6)

Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence); Fourier series, Euler formulas, Convergence of Fourier series (without proof), half range sine and cosine series.

4. Text Books

1. H. Anton, I. Biven,S.Davis, "*Calculus*", Wiley, 10th edition, 2015.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, 10thEdition, John Wiley & Sons, 2016.

5. Reference Books

1. 1. J. Stewart, *Essential Calculus*, Cengage, 2nd edition, 2017
2. G.B. Thomas and R.L. Finney, *Calculus and Analytic geometry*, 9 th Edition, Pearson, Reprint, 2002.
3. Peter V. O'Neil, *Advanced Engineering Mathematics* , Cengage, 7th Edition, 2012
4. Veerarajan T., *Engineering Mathematics for first year*, Tata McGraw-Hill, New Delhi, 2008.
5. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 36 Edition, 20102.

6. Course Outcomes

After the completion of the course the student will be able to

CO 1: Solve systems of linear equations, diagonalize matrices and characterize quadratic Forms.

CO 2: Compute the partial and total derivatives and maxima and minima of multivariable Functions.

CO 3: Compute multiple integrals and apply them to find areas and volumes of geometrical Shapes.

CO 4: Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent.

CO 5: Determine the Taylor and Fourier series expansion of functions and learn their Applications.

7. Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1			1	2		2
CO2	3	3	3	3	2	1			1	2		2
CO3	3	3	3	3	2	1			1	2		2
CO4	3	2	3	2	1	1			1	2		2
CO5	3	3	3	3	2	1			1	2		2

8. Assessment Pattern

Learning Objectives	Continuous Internal Evaluation (CIE)		End Semester Examination (ESE out of 100)
	Internal Examination 1 (50)	Internal Examination 2 (50)	
Remember	10	10	20
Understand	20	20	40
Apply	20	20	40
Analyse			
Evaluate			
Create			

9. Mark Distribution

Total	CIE				ESE
	Attendance	Internal Examination	Assignment/Quiz/ Course Project	Total	
150	10	25	15	50	100

10. End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have maximum 2 sub-divisions and carry 14 marks.

****