Course Code	Course Title							
116U06C101	Applied Mathematics - I							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	03			--		01*		04
Credits Assigned	03			--		01		04
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	30	20	50	25	--	--	--	125

* Batch wise Tutorial

Course prerequisites

- Differentiation Methods
- Basics of Complex numbers
- Basics of Matrices, Inverse and Adjoint of Matrix

Course Objectives

The objective of the course is to impart knowledge of De-Moivre's theorem, hyperbolic functions and logarithm of complex numbers. The course clarifies the concept of partial differentiation and its applications. The concept of rank of matrix, solving system of linear equations, Eigen values and Eigen vectors is also conveyed.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Solve problems involving different forms and properties of complex numbers, hyperbolic functions and logarithm of complex numbers.
CO2. Apply the concept of rank of a matrix and numerical methods to solve system of linear equations.
CO3. Find Eigen values, Eigen vectors of a matrix, apply Cayley-Hamilton theorem, diagonalise a matrix and find functions of square matrices.
CO4. Find partial derivatives of multivariable functions, apply the concept of partial differentiation to find maxima and minima of multivariable functions (2-3 variables)
CO5. Apply Euler's theorem to prove results related to Homogeneous functions.

Module No.	Unit No.	Details	Hrs.	CO
1	**Complex Numbers, Hyperbolic Functions and Logarithm of Complex Number**		**12**	**CO1**
	1.1	Statement of De Moivre's theorem and related examples		
	1.2	Powers and roots of complex numbers		
	1.3	Circular functions of complex number and hyperbolic functions		
	1.4	Inverse circular and inverse hyperbolic functions		
	1.5	Logarithmic functions		
	1.6	Separation of real and imaginary parts		
		#Self-learning topics: Expansion of $sin^n\theta$, $cos^n\theta$ in terms of sine and cosine of multiples of angle θ and expansion of $sinn\theta, cosn\theta$ in powers of $sin\theta, cos\theta$		
2	**Matrix Theory: Rank of Matrix**		**8**	**CO 2**
	2.1	Types of matrices: Hermitian, Skew-Hermitian, Unitary and Orthogonal matrix		
	2.2	Rank of a matrix using row echelon forms, reduction to normal form, and PAQ form		
	2.3	System of homogeneous and non-homogeneous equations, their consistency and solutions		
	2.4	Linearly dependent and independent vectors		
	2.5	Solution of system of linear algebraic equations by **(a)** Gauss Seidal method **(b)** Jacobi iteration method		
		#Self-learning topics: Symmetric, Skew-symmetric matrices and properties, Properties of adjoint and inverse of a matrix		
3	**Matrix Theory: Eigen values & Eigen vectors**		**12**	**CO 3**
	3.1	Characteristic equation, Eigen values and Eigen vectors, Properties of eigen values and eigen vectors		
	3.2	Statement of Cayley-Hamilton theorem, Examples based on verification and application of Cayley-Hamilton theorem		
	3.3	Similarity of matrices, Diagonalisation of a matrix		
	3.4	Functions of square matrix, Derogatory and non-derogatory matrices, Minimal polynomial		
4	**Partial Differentiation and Application**		**9**	**CO4**
	4.1	Functions of several variables, Partial derivatives of first and higher order (definition using limits and simple problems)		
	4.2	Differentiation of composite functions and Total differentials		
	4.3	Maxima and minima of a function of two independent variables		
	4.4	Introduction of Jacobian of two and three independent variables (simple problems)		

5	**Homogeneous Functions**		**4**	**CO5**
	5.1	Euler's theorem on homogeneous functions with two and three independent variables (statement only) and problems		
	5.2	Deductions(Corollaries) from Euler's theorem (statements only) and problems		
		Total	**45**	

Text Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	B. S. Grewal	*Higher Engineering Mathematics*	Khanna Publications, India	43rd Edition 2014
2.	Shanti Narayan	*A text book of Matrices*	S. Chand, India	10th Edition 2004
3.	P. N. Wartikar and J. N. Wartikar	*A text book of Applied Mathematics Vol I & II*	Pune VidyarthiGruha, India	6th Edition 2012

Reference Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Erwin Kreyszig	*Advanced Engineering Mathematics*	Wiley Eastern Limited, India	10th Edition 2015
2.	Dennis G. Zill and Michael R. Cullen	*Advanced Engineering Mathematics*	Narosa Publication India	3rd Edition 2010
3.	Glyn James	*Advanced Modern Engineering Mathematic*	Pearson Publication India	4th Edition 2010
4.	Ramana B.V.	*Higher Engineering Mathematics*	Tata Mcgraw Hill New Delhi, India	34th Edition (reprint) 2019

 # Students should prepare all self-learning topics on their own. Self-learning topics will enable students to gain extended knowledge of the topic. Assessment of these topics may be included in Tutorials.

Term-Work will consist of Tutorials covering entire syllabus. Students will be graded based on continuous assessment of their term work