



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
BS11	Engineering Mathematics-I	4	1	--	4	1	--	5
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

**Course Objectives:** To develop mathematical skills for solving engineering problems.

Pre-requisite Course Codes		HSC level Mathematics
After successful completion of the course, student will be able to		
Course Outcomes	CO1	To find powers, roots and logarithm of a complex number and separate function of a complex number into real and imaginary parts
	CO2	To find nth order derivative of a function and product of functions
	CO3	To expand the given function as power series
	CO4	To differentiate a function partially and apply it to extremise functions
	CO5	To find rank of a matrix and solve system of linear equations and its applications
	CO6	To solve system of linear equations by Numerical Methods and to encode and decode messages

Module No	Module name	Unit No.	Topics	Ref	Hrs.
1	Complex Numbers		<b>Revision:</b> Complex Numbers as ordered pairs, Argand's diagram, Cartesian, Polar and Exponential form of Complex Numbers.		01
		1.1	De'moivre's Theorem and its application to determine powers of complex numbers. Roots of complex numbers by De'moivre's Theorem	1,2,3,5	03
		1.2	Expansion of $\sin n\theta$ and $\cos n\theta$ in terms of powers of $\sin \theta$ and $\cos \theta$ . Expansion of $\sin^n \theta$ and $\cos^n \theta$ in terms of sines and cosines		02
		1.3	Hyperbolic Function: Circular function and relation between circular and hyperbolic function, Inverse hyperbolic functions. Separation into real and imaginary parts of complex functions.		05
		1.4	Logarithm of complex numbers.		1,2,3,5
2	Differential Calculus	2.1	Successive Differentiation: nth derivative of standard functions.	1,2,3,5	02



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		2.2	Leibnitz's Theorem on nth derivative of product of two functions.		02
		2.3	Infinite series: Maclaurin's series(without proof). Expansion of standard functions, Expansion of function in power series using i) Maclaurin's series ii) Standard series method iii) Method of differentiation and integration iv) Method of substitution.		05
		2.4	Taylor's Series (Without Proof).i) Expansion of function $f(x + h)$ in powers of x and h ii) $f(x)$ in powers of $(x - a)$		01
3	<b>Partial Differentiation</b>	3.1	Partial derivatives of first and higher order, total differential coefficient and total derivative. Partial derivatives of Composite and Implicit functions.	1,2,3,5	04
		3.2	Euler's theorem on homogeneous functions with two and three independent variables, deduction from Euler's theorem		03
		3.3	Application of partial derivatives: i) Local Maxima and Minima of functions of two variables. ii) Lagrange's Method of undetermined multipliers.		04
4	<b>Matrix and Vectors</b>		<b>Revision:</b> Revision of basic matrix and vectors.		01
		4.1	Rank of Matrix, Normal form, and Echelon form.		03
		4.2	Consistency and solution of simultaneous linear homogeneous and Non-homogeneous equations.		04
		4.3	Application of solving system of equations in electrical networks, traffic control and balancing chemical equations.	1,2,3,4,5,6,7	02
		4.3	Linear dependence and independence of vectors.		02
		4.4	Curl and divergence of a vector.		01
		4.5	Solution of system of linear algebraic equations, by (1) Gauss Elimination Method, (2) Gauss Jacobi Iteration Method, (3) Gauss Seidel Method.		03
		4.6	Application of matrices to Coding and De-coding		02
Total					52



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## References:

- [1] Kreyszig, "Advanced Engineering Mathematics", 9<sup>th</sup> edition, John Wiley
- [2] H.K.Dass,"Advanced Engineering Mathematics", 28<sup>th</sup> edition,S.Chand, 2010
- [3] Grewal B.S., "Higher Engineering Mathematics", 38<sup>th</sup>edition, Khanna Publication
- [4] H Anton and CRorres,"Elementary Linear Algebra Application Version", 6th edition, John Wiley& Sons, 2010
- [5] Jain and Iyengar, "Advanced Engineering Mathematics", 4<sup>th</sup> edition, Narosa Publishing House, Pvt. Ltd, 2014
- [6] S.S. Sastry, "Introductory Methods of Numerical Analysis", 4<sup>th</sup> edition, Prentice-Hall of India Pvt.Ltd.
- [7] M. Eisenberg, "Hill Cipher and Modular Linear Algebra", 3 Nov 1999