

Savitribai Phule Pune University		
First Year of Engineering (2024 Pattern)		
Course Code: BSC-101-BES Course Name: Engineering Mathematics-I		
Teaching Scheme	Credit	Examination Scheme
Theory : 3 Hours/Week	03	CCE : 30 Marks
Tutorial : 1 Hour/Week	01	End-Semester : 70 Marks
		Term Work : 25 Marks
Prerequisite Courses, if any: Differentiation, Integration, Maxima and Minima, Matrices and Determinants.		
Course Objectives: To familiarize the students with concepts and techniques in Calculus, Fourier series and Linear Algebra. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.		
Course Outcomes: After successful completion of the course, learner will be able to: CO1: Apply mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems. Determine the Fourier series representation and harmonic analysis of periodic functions in engineering applications. CO2: Evaluate derivative functions of several variables that are essential in various engineering problems. CO3: Apply the concept of Jacobian to find partial derivatives of implicit function and functional dependence. Use of partial derivatives in estimating errors & approximations and finding extreme values of the function. CO4: Apply the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, Linear dependence & Independence, finding linear and orthogonal transformations. CO5: Determine Eigen values & Eigen vectors. Use it to diagonalize matrix and to reduce quadratic form to canonical form, applicable to engineering problems.		
Course Contents		
Unit I	Single Variable Calculus	(08 Hours)
Rolle's Theorem, Mean Value Theorems, Taylor's and Maclaurin's Series, Indeterminate Forms and L' Hospital's Rule. Fourier series: Full range and Half range Fourier series, Harmonic analysis, Applications to problems in Engineering		
Unit II	Multivariable Calculus – Partial Differentiation	(08 Hours)
Introduction to functions of several variables, Limit, Continuity and Partial Derivatives. Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative and Change of		

Independent variables.		
Unit III	Applications of Partial Differentiation	(08 Hours)
Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers and Applications to problems in Engineering		
Unit IV	Linear Algebra – Matrices and System of Linear Equations	(08 Hours)
Rank of a Matrix, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Application to problems in Engineering.		
Unit V	Linear Algebra - Eigen Values, Eigen Vectors and Diagonalization	(08 Hours)
Eigen Values and Eigen Vectors, Cayley Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations. Application to problems in Engineering.		
Learning Resources		
Text Books:		
1.Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)		
2.Higher Engineering Mathematics by B. S. Grewal (Khanna Publication)		
Reference Books:		
1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)		
2. Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education)		
3. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)		
4. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson)		
5. Applied Mathematics (Vol. I & Vol. II) by P.N.Wartikar and J.N.Wartikar Vidyarthi Griha Prakashan, Pune.		
6. Elementary Linear Algebra. by Ron Larson and David C. Falvo (Houghton Mifflin Harcourt Publishing Company)		
MOOC / NPTEL/YouTube Links: - https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG		
Tutorial and Term Work:		
1. Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.		
2. Term work shall consist of six assignments each on unit-I to unit-VI and is based on performance and continuous internal assessment.		