

## ENGINEERING MATHEMATICS-I

[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2017 -2018)

SEMESTER - I/II

Subject Code	17MAT11	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS - 04

### Course Objectives:

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

- $n^{\text{th}}$  derivatives of product of two functions and polar curves.
- Partial derivatives
- Vector calculus
- Reduction formulae of integration; To solve First order differential equations.
- Solution of system of linear equations , quadratic forms.

### Module - 1

**Hours - 10**

**Differential Calculus -1:** determination of  $n^{\text{th}}$  order derivatives of Standard functions - Problems. Leibnitz's theorem (without proof) - problems.

**Polar Curves** - angle between the radius vector and tangent, angle between two curves, Pedal equation of polar curves. Derivative of arc length - Cartesian, Parametric and Polar forms (without proof) - problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms (without proof) -problems

### Module -2

<p><b>Differential Calculus -2</b></p> <p>Taylor's and Maclaurin's theorems for function of one variable(statement only)- problems. Evaluation of Indeterminate forms.</p> <p><b>Partial derivatives</b> – Definition and simple problems, Euler's theorem(without proof) – problems, total derivatives, partial differentiation of composite functions-problems. Definition and evaluation of Jacobians</p>	<p><b>Hours - 10</b></p>
<p><b>Module – 3</b></p>	
<p><b>Vector Calculus:</b></p> <p>Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions. Definition of Gradient, Divergence and Curl-problems. Solenoidal and Irrotational vector fields. Vector identities - <math>\text{div}(\phi A)</math>, <math>\text{curl}(\phi A)</math>, <math>\text{curl}(\text{grad } \phi)</math>, <math>\text{div}(\text{curl } A)</math>.</p>	<p><b>Hours - 10</b></p>
<p><b>Module-4</b></p>	
<p><b>Integral Calculus:</b></p> <p>Reduction formulae - <math>\int \text{Sin}^n x dx</math>, <math>\int \text{Cos}^n x dx</math>, <math>\int \text{Sin}^m x \text{Cos}^n x dx</math>, (m and n are positive integers), evaluation of these integrals with standard limits (0 to <math>\pi/2</math>) and problems.</p> <p><b>Differential Equations ;</b></p> <p><b>Solution of first order and first degree differential equations</b> – Exact, reducible to exact and Bernoulli's differential equations .Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling.</p>	<p><b>Hours - 10</b></p>
<p><b>Module-5</b></p>	

<p><b>Linear Algebra</b></p> <p>Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss-Jordan method and Gauss-Seidel method</p> <p>Eigen values and Eigen vectors, Rayleigh's power method to find the largest Eigen value and the corresponding Eigen vector.</p> <p>Linear transformation, diagonalisation of a square matrix .</p> <p>Reduction of Quadratic form to Canonical form</p>	<p><b>Hours - 10</b></p>
<p><b>Course outcomes:</b></p> <p>On completion of this course, students are able to</p> <ul style="list-style-type: none"> <li>• Use partial derivatives to calculate rates of change of multivariate functions.</li> <li>• Analyze position, velocity, and acceleration in two or three dimensions using the calculus of vector valued functions.</li> <li>• Recognize and solve first-order ordinary differential equations, Newton's law of cooling</li> <li>• Use matrices techniques for solving systems of linear equations in the different areas of Linear Algebra.</li> </ul>	
<p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 16 marks</li> <li>• There will be <b>2</b> full questions(with a <b>maximum</b> of <b>four</b> sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer <b>5</b> full questions, selecting one full question from each module.</li> </ul>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. B.S. Grewal, "<b>Higher Engineering Mathematics</b>", Khanna publishers, 42<sup>nd</sup> edition, 2013.</li> </ol>	

2. Erwin Kreyszig, "**Advanced Engineering Mathematics**I, Wiley, 2013

**Reference Books:**

1. B.V. Ramana, "**Higher Engineering Mathematics**", Tata Mc Graw-Hill, 2006
2. N.P.Bali and Manish Goyal, "**A text book of Engineering mathematics**", Laxmi publications, latest edition.
3. H.K. Dass and Er. RajnishVerma, "**Higher Engineerig Mathematics**", S.Chand publishing, 1<sup>st</sup> edition, 2011.