



Kot Bhalwal, Jammu

Model Institute of Engineering  
& Technology (Autonomous)  
Course Handout

## COURSE HANDOUT

Engineering Mathematics-I (BSC-101)

Civil Engineering – Ist Semester

ACADEMIC YEAR (2024-25)

**Dr. Pallavi Sharma**

Assistant Professor

Department of Applied Sciences and Humanities



Department of Civil Engineering

Model Institute of Engineering & Technology (Autonomous)

Kot Bhalwal, Jammu - 181122

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Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
BSC – 101	Engineering Mathematics-I	Core	5	3	2	0	50	100	150

### COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Apply the knowledge of calculus to plot graphs of functions and solve the problem of maxima and minima.
CO2	Determine the convergence/divergence of infinite series, approximation of functions using power and Taylor's series expansion and error estimation.
CO3	Apply the concept of definite integrals to calculate area under the curves.
CO4	Understand and apply the concepts of matrices.
CO5	Demonstrate knowledge of vector space by solving associated problems.

#### Unit-I

Differential Calculus - I: Leibnitz theorem (without proof), Partial differentiation, Euler's theorem on homogeneous functions, Asymptotes, Double points, curvature, Curve tracing in Cartesian, polar and parametric forms. (11 Hours)

#### Unit-II

Differential Calculus-II: Rolle's Theorem, Mean value Theorem, Taylor's and Maclaurin's series with remainder, indeterminate forms, Taylor series in two variables, Maxima and Minima of functions of two variables, method of Lagrange's multipliers. (11 Hours)

#### Unit-III

Integral Calculus: Definite integrals with important properties, differentiation under the integral sign, Gamma, Beta and error functions with simple problems, applications of definite integrals to find length, area, volume and surface area of revolutions, transformation of coordinates, double and triple integrals with simple problems. (10 Hours)

#### Unit-IV

Matrices, vectors: addition and scalar multiplication, matrix Multiplication, Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss Jordan elimination. (15 Hours)

#### Unit-V

Vector Space, linear dependence of vectors, basis, dimension, Linear Transformations, range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal matrices, eigen bases. (10 Hours)



### Textbooks

S. No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub. Yr.)
1	Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications	43rd (2017)
2	Calculus and Analytic Geometry	Thomas and Finney	Addision Wesley, Narosa	1st (2010)

### Reference Books

S. No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub. Yr.)
1	Advanced Engineering Mathematics	Sharma, Pratibha Mishra	Bhavya Books	2nd (2019)
2	Integral Calculus	S. Narayan	S. Chand, New Delhi	35th (2005)
3	Engineering Mathematics	N.P Bali	Laxmi publications	13th (2016)

COURSE PLAN		
Unit-I Differential Calculus-I		
S. No	Topics	Recommended Books
1	Leibnitz theorem	Book 1, Ch.2
2	Partial differentiation	Book 1, Ch.2
3	Euler's theorem on homogeneous functions	Book 1, Ch.2
4	Asymptotes	Book 1, Ch.2
5	Double points	Book 1, Ch.2
6	Curvature	Book 1, Ch.2
7	Curve tracing in Cartesian, polar and parametric forms.	Book 1, Ch.2
Unit-II Differential Calculus-II		
8	Rolle's Theorem and Mean value Theorem	Book 1, Ch.2
9	Taylor's and Maclaurin's series with remainder	Book 1, Ch.2
10	Indeterminant forms	Book 1, Ch.1
11	Taylor series in two variables	Book 2, Ch.2
12	Maxima and Minima of functions of two variables	Book 2, Ch.2
13	Maxima and Minima of functions of two variables	Book 2, Ch.2
Unit-III Integral Calculus		
14	Definite integrals with important properties	Book 1, Ch.2
15	Differentiation under the integral sign	Book 2, Ch.2
16	Gamma Function with problems	Book 2, Ch.2
17	Beta Function with problems	Book 2, Ch.2
18	Applications of definite integrals to find length, area, volume and surface area of revolutions	Book 2, Ch.2



19	Transformation of coordinates	Book 2, Ch.2
20	Double and triple integrals with simple problems	Book 2, Ch.2
<b>Unit-IV Matrices</b>		
21	Matrices	Book 1, Ch.1
22	Vectors: addition and scalar multiplication	Book 1, Ch.1
23	Matrix Multiplication	Book 1, Ch.1
24	Linear systems of equations	Book 1, Ch.1
25	Linear Independence and rank of a matrix	Book 1, Ch.1
26	Determinants and Cramer's Rule	Book 1, Ch.1
27	Inverse of a matrix	Book 1, Ch.1
28	Gauss elimination and Gauss Jordan elimination.	Book 1, Ch.1
<b>Unit-V Vector Space</b>		
29	Vector Space and linear dependence of vectors	Book 1, Ch.1
30	Basis and dimension of vectors	Book 1, Ch.1
31	Linear Transformations	Book 1, Ch.1
32	Range and kernel of a linear map	Book 1, Ch.1
33	Rank and nullity Theorem	Book 1, Ch.1
34	Inverse of a linear transformation	Book 1, Ch.1
35	Composition of linear maps	Book 1, Ch.1
36	Eigenvalues and eigenvectors	Book 1, Ch.1
37	Symmetric, skew-symmetric, and orthogonal matrices	Book 1, Ch.1

### ADDITIONAL WEB RESOURCES

1.	<a href="https://nptel.ac.in/courses/111107108/5">https://nptel.ac.in/courses/111107108/5</a> This link contains lecture by Prof S. K. Gupta IIT Roorkee on topic <b>partial differentiation</b> .
2.	<a href="https://nptel.ac.in/courses/111106100/4">https://nptel.ac.in/courses/111106100/4</a> This link contains nptel IIT lectures on topics of differential <b>equation</b> which will help the students to prepare for examinations delivered by Dr. Srinivasa Rao Manam (Depts. of mathematics) IIT Madras Chennai.
3.	<a href="https://nptel.ac.in/courses/122104017/25">https://nptel.ac.in/courses/122104017/25</a> This link contains lecture by Prof S.K Ray on topic <b>Mean value theorem</b> .

### GRADING AND ASSESSMENT

- **Sessional Test:** 20 marks
- **Assignment:** 20 marks
- **Attendance:** 10 marks
- **Final Examination:** 100 marks

### COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.



### FACULTY INFORMATION

- **Office Hours**  
Monday (12:55 PM - 1:45 PM)  
Wednesday (12:55 PM - 1:45 PM)
- **Contact Information**  
[pallavi.ash@mietjammu.in](mailto:pallavi.ash@mietjammu.in)