LESSON PLAN ENGINEERING MATHEMATICS-II

PREPARED BY JITENDRA KUMAR MALIK (LECTURER IN MATHEMATICS)



GOVERNMENT POLYTECHNIC BARGARH

DEPARTMENT OF MATHEMATICS & SCIENCE

GOVERNMENT POLYTECHNIC BARGARH

VISION

To be a reputed polytechnic institute imparting quality technical education to produce diploma engineers with dynamic personalities and innovative competencies in the state of Odisha.

MISSION

- To offer the best and advanced lab facilities adhering to the curriculum to make future engineers.
- To engage highly qualified and competent faculties to make the student acquire the skillful knowledge required.
- To develop an excellent teaching learning environment leading to create the best institute.

SYLLABUS

Th.3. ENGINEERING MATHEMATICS — II (2nd Sem Common)

Theory: 5 Periods per Week Total Periods: 75 Periods Examination: 3 Hours I.A : 20 Marks End Sem Exam : 80 Marks TOTAL MARKS : 100 Marks

Objective:

Principles and application in Engineering are firmly ground on abstract mathematical structures. Students passing from secondary level need familiarization with such structure with a view to develop their knowledge, skill and perceptions about the applied science. Calculus is the most important mathematical tool in forming engineering application into mathematical models. Wide application of calculus makes it imperative to develop methods of solving differential equations. The knowledge of limit, derivative and derivative needs to be exhaustively practiced. To help a systematic growth of skill in solving equation by calculus method will be the endeavor of this course content. Understanding the concept of co-ordinate system in 3D in case of lines, planes and sphere and it's use to solve Engineering problems. After completion of the course the student will be equipped with basic knowledge to form equations and solve them competently.

Topic wise distribution of periods

SI No	Topics	Periods	Marks
1	Vector Algebra	15	12
2	Limits and Continuity	12	12
3	Derivatives	21	20
<u>3</u> 4	Integration	15	24
4 5	Differential Equation	12	12
TOTAL		75	80

COURSE CONTENTS:

1) VECTOR ALGEBRA

b) Types of vectors (null vector, parallel vector , collinear vectors) (in component form)

c) Representation of vector

d) Magnitude and direction of vectors

e) Addition and subtraction of vectors

f) Position vector

g) Scalar product of two vectors

h) Geometrical meaning of dot product

Angle between two vectors

Scalar and vector projection of two vectors

 k) Vector product and geometrical meaning (Area of triangle and parallelogram)

2) LIMITS AND CONTINUITY

a) Definition of function, based on set theory

b) Types of functions

i) Constant function

Identity function

III) Absolute value function

iv)The Greatest integer function

V) Trigonometric function

vi) Exponential function

vii) Logarithmic function

c) Introduction of limit

d) Existence of limit

e) Methods of evaluation of limit

i)
$$\lim_{x\to 0} \frac{x^n-a^n}{x=a} = na^{n-1}$$

i)
$$\lim_{x\to 0} \frac{x^n - a^n}{x - a^n} = na^{n-1}$$
ii) $\lim_{x\to 0} \frac{a^x - 1}{x} = \log_e a$
iii) $\lim_{x\to 0} \frac{e^x - 1}{x} = 1$

iii)
$$\lim_{x\to 0} \frac{e^{x}-1}{x}=1$$

iv)
$$\lim_{x\to 0} (1+x)^{1/x} = e$$

$$v) \lim_{x \to \infty} \frac{\left(1 + \frac{1}{x}\right)^{n} = e}{\log(1 + x)} = 1$$

iv)
$$\lim_{x\to 0} \frac{x}{(1+x)^{1/x}} = e$$

v) $\lim_{x\to \infty} \frac{(1+\frac{1}{x})^x}{(1+\frac{1}{x})^x} = e$
vi) $\lim_{x\to 0} \frac{\log(1+x)}{x} = 1$
vii) $\lim_{x\to 0} \frac{\sin x}{x} = 1$
viii) $\lim_{x\to 0} \frac{\tan x}{x} = 1$

$$\forall ii) \lim_{x\to 0} \frac{\sin x}{x} = 1$$

e) Definition of continuity of a function at a point and problems based on it

3) DERIVATIVES

- a) Derivative of a function at a point
- b) Algebra of derivative
- c) Derivative of standard functions

 x^{n} , a^{x} , $\log_{a} x$, e^{x} , $\sin x$, $\cos x$, $\tan x$, $\cot x$, $\sec x$, $\csc x$, $\sin^{-1} x$, $\cos^{-1} x$, $\tan^{-1} x$, $\cot^{-1} x$, $\sec^{-1} x$, $\csc^{-1} x$

- d) Derivative of composite function (Chain Rule)
- e) Methods of differentiation of
 - i) Parametric function
 - ii) Implicit function
 - iii) Logarithmic function
 - iv) a function with respect to another function
 - f) Applications of Derivative
 - i) Successive Differentiation (up to second order)
 - ii) Partial Differentiation (function of two variables up to second order)
 - g) Problems based on above

4) INTEGRATION

- a) Definition of integration as inverse of differentiation
- b) Integrals of standard functions
- c) Methods of integration
 - i) Integration by substitution
 - ii) Integration by parts

ii) Integration by parts
d) Integration of the following forms
i)
$$\int \frac{dx}{x^2 + a^2}$$
 ii) $\int \frac{dx}{x^2 - a^2}$ iii) $\int \frac{dx}{a^2 - x^2}$ iv) $\int \frac{dx}{\sqrt{x^2 + a^2}}$ v) $\int \frac{dx}{\sqrt{x^2 - a^2}}$ vii) $\int \frac{dx}{\sqrt{x^2 - a^2}}$ viii) $\int \sqrt{a^2 - x^2} dx$ ix) $\int \sqrt{a^2 + x^2} dx$ x) $\int \sqrt{x^2 - a^2} dx$

- e) Definite integral, properties of definite integrals
 - i) $\int_0^a f(x) dx = \int_0^a f(a-x)dx$

 - $\begin{array}{l} \text{ii)} \int_{a}^{b} \, f(x) \, dx = \, \int_{b}^{a} \, f(x) \, dx \\ \text{iii)} \, \int_{a}^{c} \, f(x) \, dx = \, \int_{a}^{b} \, f(x) dx + \, \int_{b}^{c} \, f(x) \, dx \, \, , \, \, a < b < c \end{array}$
 - iv) $\int_{-a}^{a} f(x) dx = 0$, if f(x) = odd
 - $=2\int_0^a f(x) dx, if f(x) = even$
- f) Application of integration
 - i) Area enclosed by a curve and X axis
 - ii) Area of a circle with centre at origin

5) DIFFERENTIAL EQUATION

- a) Order and degree of a differential equation
- b) Solution of differential equation
 - i) 1st order and 1st degree equation by the method of separation of variables
 - ii) Linear equation $\frac{dy}{dx} + Py = Q$, where P,Q are functions of x

Syllabus to be covered up to IA Ch. 2 and Ch. 3

Books Recommended:

1. Elements of Mathematics _Vol. _ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

Reference Books:

Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

COURSE OUT COME:-

AFTER COMPLETION OF THE COURSE, THE STUDENTS WILL BE ABLE TO

CO1:- Understand the basics of vectors, operations on vectors and their geometrical interpretation.

CO2:-Recognize and describe the way in which limit of the function exists, Calculate limit in determinant form and verify the continuity of a function at a point.

CO3:- Elucidate the definition of derivatives and apply its concepts analytically, graphically and numerically. As well as calculate higher order derivatives & Partial derivatives.

CO4:- Evaluate area enclosed by a curve & Co-ordinate axis and evaluate definite and indefinite integrals by different method of integrations.

CO5:- Analyze the concept of differential equations, its order and degree .Equipped with basic knowledge to form equations and solve them competently.

	mine: Math & Sc	Semester:	2 ND			
Sub: Engineering Mathematics-II Week 1st		No of Days/weeks-06 Total Class allotted-75		DATE: 20-03-2023 to 27-06-2023 Session-2022-23(Samuel		
				Session-2022-23(Summer)		
		20-03-2023		Name of the Teaching faculty: Iltendra Kumar Malik, Lecturer in Mathematics Theory Topics		
		21-03-2023		The Mathematics		
		21-03-2023		Introduction & examples of vectors		
		03-2023		Representation of years		
		22-03-2023 23-03-2023		position on wast		
1		27-03-2023		Droblams		
/ 2	nd -	03-2023		Discussion of Probable questions and answers.		
		28-03-2023 28-03-2023 29-03-2023		Dot product and Cross product of two vectors & their properties. Problems Scalar & vector projection of two vectors, Area of a triangle and parallelogram.		
		03-04-2023		Angle between two vectors, related problems		
		04-04-2023		problems		
		04-04-2023		Discussion of Probable questions and answers.		
3 rd		05-04-2023		Definition of sets , Cartesian products, examples		
310		06-04-2023		Definition of relation and functions.		
		08-04-2023		Types of functions		
		10-04-2023 11-04-2023		Introduction to limit & some basis examples of limit. Problems Discussion of Probable examples and examples.		
		11-04-2023		Discussion of Probable questions and answers. Various method to finding limit		
441		12-04-2023		Problems		
4th		13-04-2023		Problems		
		15-04-2024		Definition of continuity & some appropriate examples		
		17-04-2023		Problems		
		18-04-2023		Discussion of Probable questions and answers.		
		18-04-2023		Definition of differentiation, differentiation at a point		
5th	-	19-04-2023		1st principle methods		
		20-04-2023		Problems		
	2	24-04-2023		Basic formulae for differentiation, Algebra of derivatives,		
	2	25-04-2023		Problems		
	2	25-04-2023		Discussion of Probable questions and answers.		
	24	4-04-2023		problems		
	27	-04-2023 D		Differentiation of composite functions (Chain rule)		
6 th	29	-04-2023		Problems		
	01	05-2023		Problems		
	02-	05-2023		Problems		
	02-	05-2023	Ī	Discussion of Probable questions and answers.		
	03-			Various method to find the derivative of a functions 1. Parametric function		
	04-0	05-2023				
7th	06-0	06-05-2023		Problems		
	 	08-05-2023		2.Implicit functions		
Carried State	The state of the s			Problems		
y it desired		09-05-2023 09-05-2023		3. A function w.r.t another function		
	The second secon	The state of the s	Di	Discussion of Probable questions and answers.		
		2025		Problems		
8 th	11-05-	2023		Successive differentiation (up to 2 nd order)		
THE PARTY OF THE P	13-05-	2023		Problems		
9.0	15-05-	2023		Partial differentiation		

	16-05-2023	Discussion of Probable questions and answers.	
	17-05-2023	Definitions of integrations and some basic formulae	
	18-05-2023	Integration of standard functions	
9 th	20-05-2023	Integration by substitution methods	
	22-05-2023	Problems	
	23-05-2023	Problems	
	23-05-2023	Discussion of Probable questions and answers.	
	24-05-2023	Integration by parts	
	25-05-2023	Problems	
10 th	27-05-2023	Problems	
	29-05-2023	Problems	
	30-05-2023	Problems	
	30-05-2023	Discussion of Probable questions and answers.	
	31-05-2023	Definite integration & their properties	
	01-06-2023	Problems	
11 th	03-06-2023	Problems	
	05-06-2023	Application of integrations	
	06-06-2023	problems	
	06-06-2023	Discussion of Probable questions and answers.	
	07-06-2023	Definition, order and degree of differential equations	
	08-06-2023	Solution of differential equation by variable separable meth	
12th	10-06-2023	Solution of Linear differential equation with constant coefficient	
	12-06-2023	Problems	
	13-06-2023	Problems	
	13-06-2023	Discussion of Probable questions and answers.	
	17-06-2023	Discussion of Probable questions and answers.	
	19-06-2023	Discussion of Probable questions and answers.	
13 th	21-06-2023	Discussion of Probable questions and answers.	
	22-06-2023	Discussion of Probable questions and answers.	
	23-06-2023	Discussion of Probable questions and answers.	
	24-06-2023	Discussion of Probable questions and answers.	
	2606-2023	Discussion of Probable questions and answers.	
14 th	27-06-2023	Discussion of Probable questions and answers.	
	27-06-2023	Discussion of Probable questions and answers.	

Signature of the faculty

Signature of the HOB