

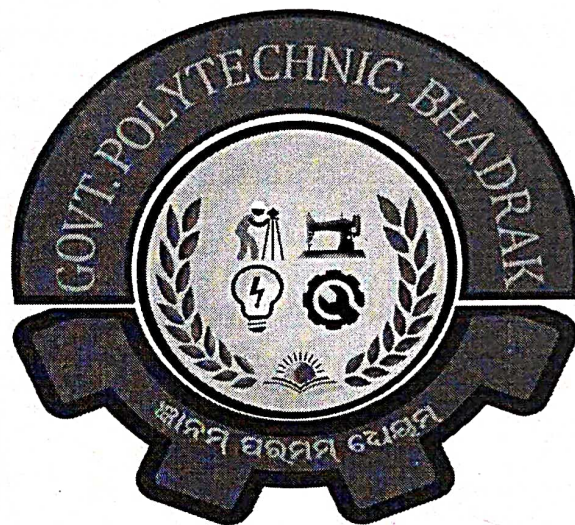
# LESSON PLAN

SUB:- *ENGINEERING MATHEMATICS-III*

BRANCH:- ELECTRICAL ENGG.

SEMESTER: 3<sup>rd</sup>

NAME OF FACULTY: - MANAS KUMAR MAHALIK



**GOVERNMENT POLYTECHNIC,  
BHADRAK**

*SES: 2023-24*

*[Signature]*  
Hod Electrical

**HOD (ELECT.)  
G.P.BHADRAK**

*[Signature]*  
Academic Co-ordinator

**Academic Co-ordinator**

*[Signature]*  
Principal

**Govt. Polytechnic Bhadrak**

**Principal  
Govt. Polytechnic  
Bhadrak**

# LESSON PLAN

## GOVERNMENT POLYTECHNIC, BHADRAK

Discipline: Electrical Engineering	Semester: 3 <sup>rd</sup>	Name of the Teaching Faculty: MANAS KUMAR MAHALIK ( LECTURER IN MATHEMATICS)	
Subject: Engineering Mathematics-III (Th1)	No. of days/week class allotted: 04	Semester from date: 01/08/2023 To date: 30/11/2023 No. of weeks: 15	
PRE-REQUISITES	Basic knowledge about Mathematics, Differentiation, Integration, Determinants, Matrices, Trigonometry		
COURSE OUTCOMES	<b>The students will be able to</b> <b>CO1:</b> Apply complex number concept in electricity, Quadratic equation, imaginary numbers in signal processing, Radar. <b>CO2:</b> Apply Matrices in Electrical Circuits and Linear programming. <b>CO3:</b> Solve higher order linear differential equations and transform engineering problems to mathematical models with help of ordinary/partial differential equations <b>CO4:</b> Apply Laplace transform and Fourier transform techniques to solve differential equations related in engineering applications <b>CO5:</b> Solve the problems of higher order of algebraic and transcendental equations by iterative methods and also solve computationally(MATLAB) <b>CO6:</b> Learn about different techniques for numerical differentiation and integration <b>CO7:</b> Use in data analysis and develop interpolating polynomials through method of differences		
Week	Class Day	Theory Topics	Delivery Method
1 <sup>st</sup>	1 <sup>st</sup>	<b>1. COMPLEX NUMBERS:</b> Real and imaginary numbers, definition of a complex number, conjugate of complex numbers, modulus of a complex number with examples	Whiteboard
	2 <sup>nd</sup>	Amplitude of a complex number, geometrical representation of a complex number with example	Whiteboard
	3 <sup>rd</sup>	Properties of complex numbers with examples	Whiteboard
	4 <sup>th</sup>	Determination of three cube roots of unity and their properties	Whiteboard
2 <sup>nd</sup>	1 <sup>st</sup>	De-Moivre's theorem and problem solving	Whiteboard
	2 <sup>nd</sup>	<b>QUIZ &amp; ASSIGNMENT-I</b>	PPT
	3 <sup>rd</sup>	<b>2. MATRICES:</b> Recap: Definition of Matrix, row. column , order of a matrix, Types of matrices: a) Row matrix, b) column matrix , c) square matrix , d) unit matrix e)Null matrix f)Lower & Upper triangular matrix	Whiteboard
	4 <sup>th</sup>	Determination of rank of a matrix by elementary transformation, with examples	Whiteboard
3 <sup>rd</sup>	1 <sup>st</sup>	Some more example of finding rank of a matrix by elementary transformation method, Consistency of linear system of equations, Rouche's Theorem, Procedure to test the consistency of linear system of equations of n unknowns.	Whiteboard
	2 <sup>nd</sup>	Examples on consistency test and solving system of equations, Solving system of linear homogeneous equations	Whiteboard
	3 <sup>rd</sup>	<b>QUIZ &amp; ASSIGNMENT-II</b>	PPT
	4 <sup>th</sup>	<b>3. LINEAR DIFFERENTIAL EQUATIONS:</b> Definitions: i) Linear differential equation , ii) Linear differential equation with constant coefficients iii) Homogeneous and non-homogeneous linear differential equation with constant	PPT



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		coefficients, Operator D, Concept of C.F. and P.I.	
4 <sup>th</sup>	1 <sup>st</sup>	General solution $y=CF+PI$ . Rules for finding the CF: Case 1:- If roots are real and different, Case 2: if roots are real and repeated, some examples on these two cases	PPT
	2 <sup>nd</sup>	Case 3: If one pair of roots be imaginary, Case 4: If two points of imaginary roots are equal, some examples on these two cases.	PPT
	3 <sup>rd</sup>	Inverse operator, Rules for finding the Particular Integral (PI): Case 1: When $X=e^{(ax)}$ , Case 2: when $X=\sin(ax+b)$ or $\cos(ax+b)$ , some examples on these two cases	PPT
	4 <sup>th</sup>	Solving problems on CF and PI	PPT
5 <sup>th</sup>	1 <sup>st</sup>	Case 3: when $X=x^m$ , Case 4: when $X=e^{(ax)}V$ , some examples on these two cases	PPT
	2 <sup>nd</sup>	Working rule to find the Complete solution $y=CF+PI$ , Examples	PPT
	3 <sup>rd</sup>	Partial differential equation (PDE), formation of PDE by eliminating arbitrary constants and arbitrary functions.	PPT
	4 <sup>th</sup>	Examples on formation of PDEs	PPT
6 <sup>th</sup>	1 <sup>st</sup>	Linear PDE of 1 <sup>st</sup> order, working rule to solve $Pp+Qq=R$ , examples	PPT
	2 <sup>nd</sup>	<b>QUIZ &amp; ASSIGNMENT-III</b>	
	3 <sup>rd</sup>	<b>4. LAPLACE TRANSFORMS:</b> Definition of Gamma function, reduction formula, example	Whiteboard
	4 <sup>th</sup>	Prove $\Gamma(\frac{1}{2}) = \sqrt{\pi}$ , Short problems on reduction formula	Whiteboard
7 <sup>th</sup>	1 <sup>st</sup>	Definition of Laplace transform of a function, inverse Laplace transform, existence of Laplace transform	Whiteboard
	2 <sup>nd</sup>	Derivation of Laplace transform of standard functions: $k, t^n, \sin ax, \cos ax, \sinh ax, \cosh ax$ .	Whiteboard
	3 <sup>rd</sup>	Properties of LT: i) Linearity property ii) First shifting property and problems on these properties.	Whiteboard
	4 <sup>th</sup>	Change of scale property, examples on it	Whiteboard
8 <sup>th</sup>	1 <sup>st</sup>	Formulation of LT of derivatives and integrals, some problems to solve	Whiteboard
	2 <sup>nd</sup>	Formulation of LT multiplication by $t^n$ , division by $t$ , examples	Whiteboard
	3 <sup>rd</sup>	Solving problems to find LT	Whiteboard
	4 <sup>th</sup>	Derivation of formula of inverse LT and problems on Inverse LT.	Whiteboard
9 <sup>th</sup>	1 <sup>st</sup>	<b>QUIZ &amp; ASSIGNMENT-IV</b>	
	2 <sup>nd</sup>	<b>5. FOURIER SERIES:</b> Definition of periodic function with example. Fourier series, Euler's formulae.	PPT
	3 <sup>rd</sup>	Establishment of some formulae: $\int_{\alpha}^{\alpha+2\pi} \cos nx \, dx, \int_{\alpha}^{\alpha+2\pi} \sin nx \, dx,$ $\int_{\alpha}^{\alpha+2\pi} \cos mx \cos nx \, dx, \int_{\alpha}^{\alpha+2\pi} \cos^2 nx \, dx$	Whiteboard
	4 <sup>th</sup>	Dirichlet's condition for Fourier expansion, example	Whiteboard
10 <sup>th</sup>	1 <sup>st</sup>	Periodic function satisfying Dirichlet's condition as a Fourier series with example	Whiteboard
	2 <sup>nd</sup>	Even function and its Fourier series in $0 \leq x \leq 2\pi$ and $-\pi \leq x \leq \pi$ . with example	Whiteboard
	3 <sup>rd</sup>	Odd function and its Fourier series in $0 \leq x \leq 2\pi$ and $-\pi \leq x \leq \pi$ . with example	Whiteboard
	4 <sup>th</sup>	Problems on even and odd function and Fourier series expansion	Whiteboard
11 <sup>th</sup>	1 <sup>st</sup>	Fourier series of continuous function in	Whiteboard

		$0 \leq x \leq 2\pi$ and $-\pi \leq x \leq \pi$ . and functions having points of discontinuity in $0 \leq x \leq 2\pi$ and $-\pi \leq x \leq \pi$ .	Whiteboard
	2 <sup>nd</sup>	<b>QUIZ &amp; ASSIGNMENT-V</b>	Whiteboard
	3 <sup>rd</sup>	<b>6. NUMERICAL METHODS:</b> Limitation of analytical methods and need of numerical method, iteration formula	Whiteboard
	4 <sup>th</sup>	Bisection method and problem solving by this method	PPT
	1 <sup>st</sup>	Solution by Newton-Raphson method	PPT
12 <sup>th</sup>	2 <sup>nd</sup>	<b>QUIZ &amp; ASSIGNMENT-VI</b>	Whiteboard
	3 <sup>rd</sup>	<b>7. FINITE DIFFERENCE AND INTERPOLATION:</b> Finite difference, forward and backward difference table	Whiteboard
	4 <sup>th</sup>	Definition of shift operator, relation between operators	Whiteboard
	1 <sup>st</sup>	Newton's forward difference interpolation for equal intervals with examples	Whiteboard
13 <sup>th</sup>	2 <sup>nd</sup>	Newton's backward difference interpolation for equal intervals with examples	Whiteboard
	3 <sup>rd</sup>	Lagrange's interpolation for unequal intervals with examples	Whiteboard
	4 <sup>th</sup>	Solving problems on Lagrange's interpolation	Whiteboard
14 <sup>th</sup>	1 <sup>st</sup>	Problems on Lagrange's interpolation and Newton's forward difference interpolation	Whiteboard
	2 <sup>nd</sup>	Newton-Cote's formula, Trapezoidal rule with example	Whiteboard
	3 <sup>rd</sup>	Simpson's 1/3 rd rule with example	Whiteboard
	4 <sup>th</sup>	<b>QUIZ &amp; ASSIGNMENT-VII</b>	Whiteboard
15 <sup>th</sup>	1 <sup>st</sup>	<b>REVISION</b>	PPT
	2 <sup>nd</sup>	<b>REVISION</b>	PPT
	3 <sup>rd</sup>	<b>PREVIOUS YEAR QUESTIONS DISCUSSION</b>	PPT
	4 <sup>th</sup>	<b>PREVIOUS YEAR QUESTIONS DISCUSSION</b>	PPT

### LEARNING RESOURCES:

1. Higher engineering mathematics, Dr B.S. Grewal, Khanna publishers
2. Elements of mathematics Vol1, Odisha state bureau of text book preparation and production
3. Text Book of Engineering Mathematics-I, C.R Mallick, Kalayani publication
4. Text Book of engineering mathematics-III, C.R Mallick, Kalayani publication

Signature of Concerned Faculty  
 (Manas Kumar Mahalik)  
 Lect (maths.)  
 3/10/2023

Signature of HOD  
 HOD (ELECT.)  
 G.P.BHADRAK  
 3/10/2023